OCTOBER 1961

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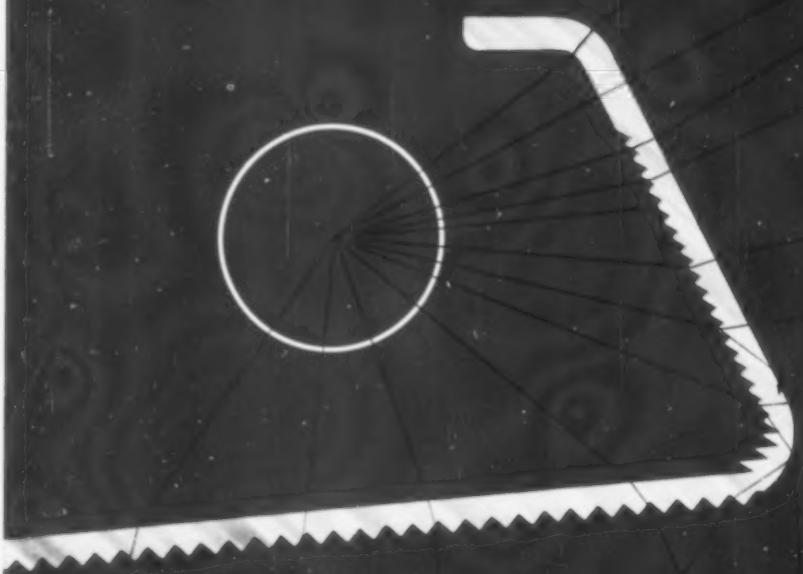
ILLUMINATING ENGINEERING

Journal of the
ILLUMINATING ENGINEERING SOCIETY

in this day of Prismatic Light Control



Read the answers to these five questions, then confidently specify:

THE WAKEFIELD

PHOTOMETRIC

TRADE MARK

Does it have a sliding clamp hanger? YES *Compare with other similar luminaires.*

Is it free of shadow-forming opaque metal end caps? YES *Compare with other similar luminaires.*

Are distribution and brightness tests and coefficients of utilization by ETL? YES *Compare with other similar luminaires.*

What is the overall light output? 67.5% *Compare with other similar luminaires.*

What is the uplight (90°-180°) distribution? 24.0% *Compare with other similar luminaires.*

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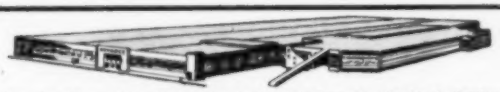

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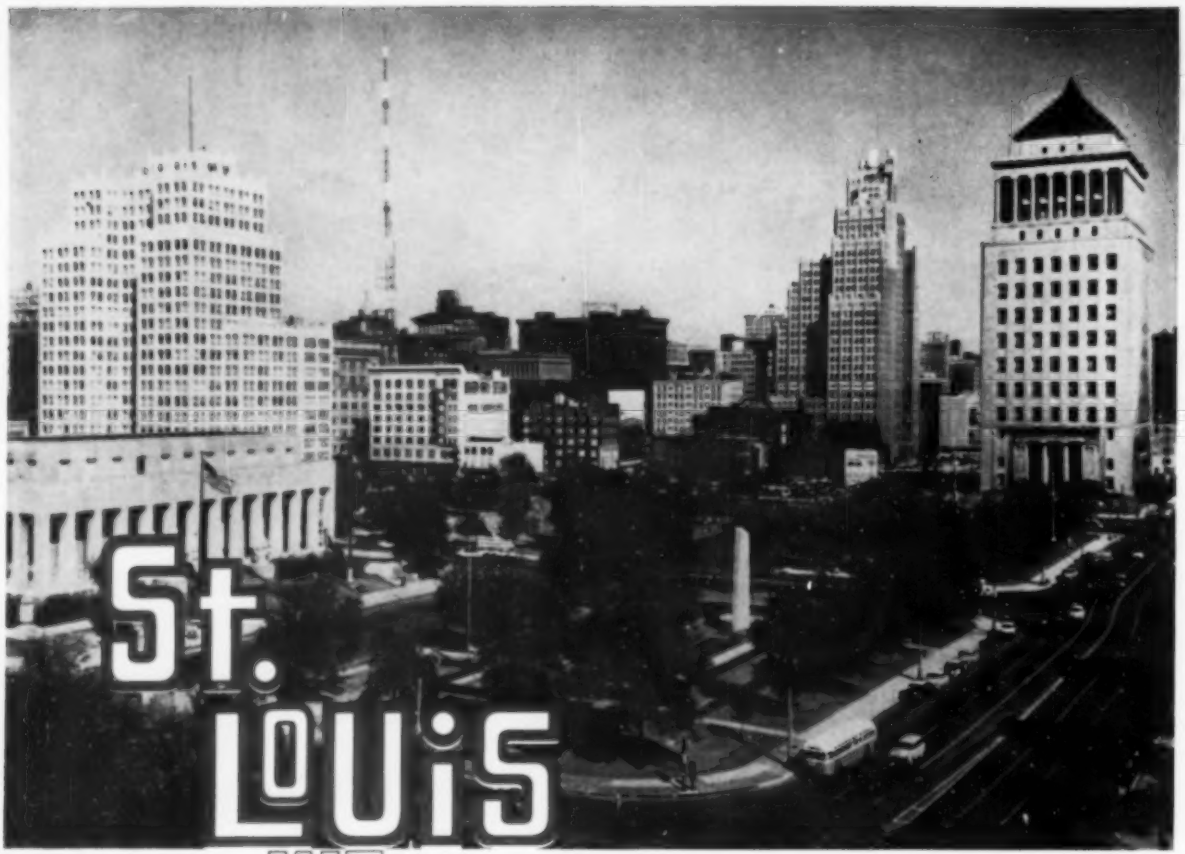
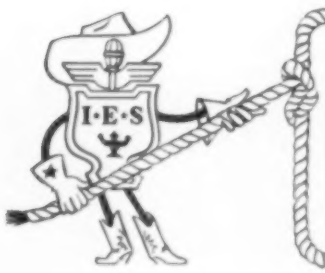


WE THANK YOU FOR A GREAT I.E.S. CONFERENCE

We're glad that we "met you in St. Louis!" It was a wonderful technical conference and our vote of thanks goes to everyone who worked so hard to make it so. From the opening get-together to the impressive banquet and closing session; no effort was spared to give us the best of everything . . in food . . hospitality . . and outstanding speakers.

We extend our thanks, too, to our host city St. Louis . . its hotels, convention bureau and civic leaders . . for their warm welcome and for the courteous way they took care of us and our needs. And to every IES member who attended . . thanks for your enthusiasm, participation and the contributions *you* made to make it a memorable occasion.



LOOK FOR US,

DALLAS

...HERE WE COME IN 1962!

Statler Hilton Hotel . . Sept. 9-14

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

October
1961

Vol. LVI, No. 10

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STATEMENTS and opinions in articles and papers in ILLUMINATING ENGINEERING are the expressions of contributors and do not necessarily represent the policies or opinions of the Society. Official Society opinions are expressed only in official committee reports specifically approved by the Council of the Illuminating Engineering Society.

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Address changes must be received at IES Headquarters by the first of the month to be effective with the issue of the next succeeding month.

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The "little red school house" was fine in its day, but future demands on our educational system require a new kind of educational plant. This high school, incorporating some of today's most forward-looking architectural concepts, promises to remain modern and efficient for years to come.

With great attention given to both form and function throughout, Day-Brite was the logical lighting choice. Semester after semester after semester, these fixtures will provide highest visual comfort with substantial long-range operating and maintenance economies.

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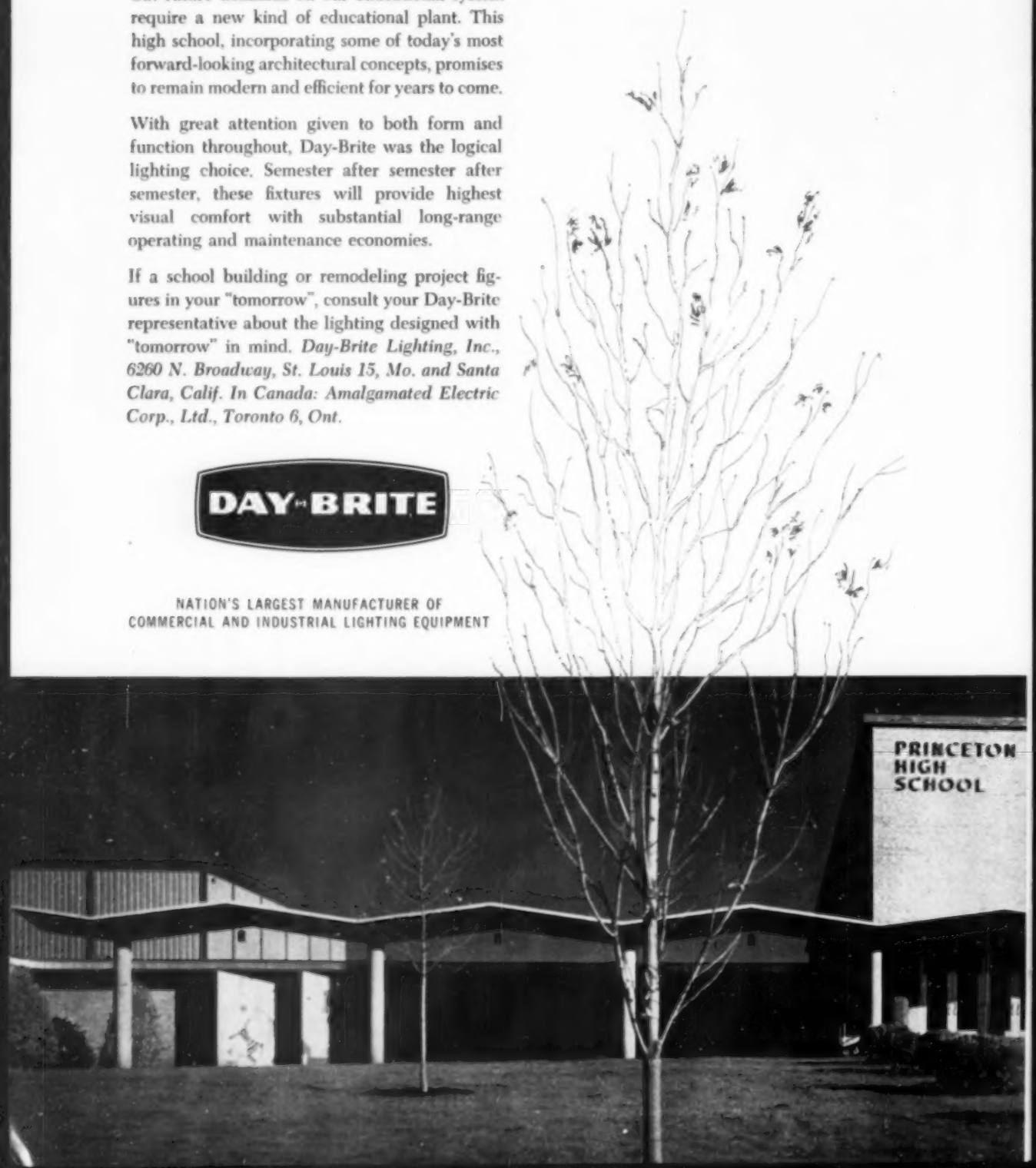

Superb Day-Brite Holiday fixtures maintain a minimum lighting level of 70 footcandles.

Princeton High School,
outside of Cincinnati

Architect:
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Consulting Engineer:
Fosdick and Hilmer

Electrical Contractor:
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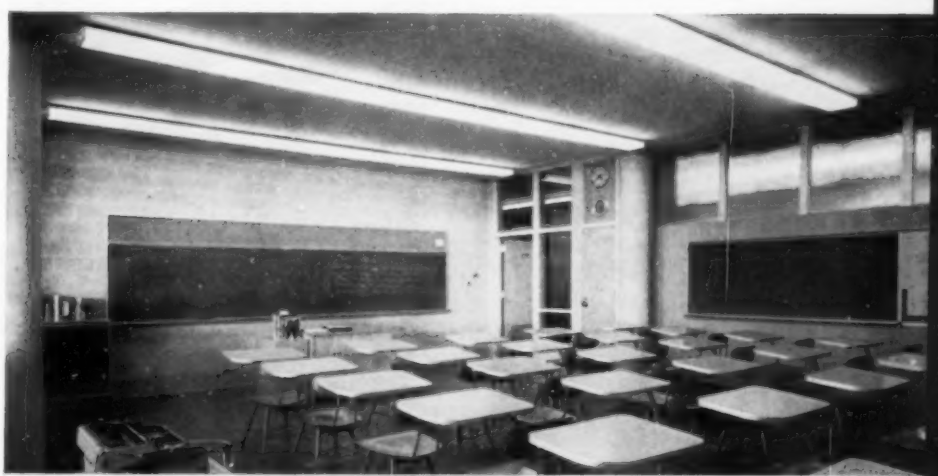
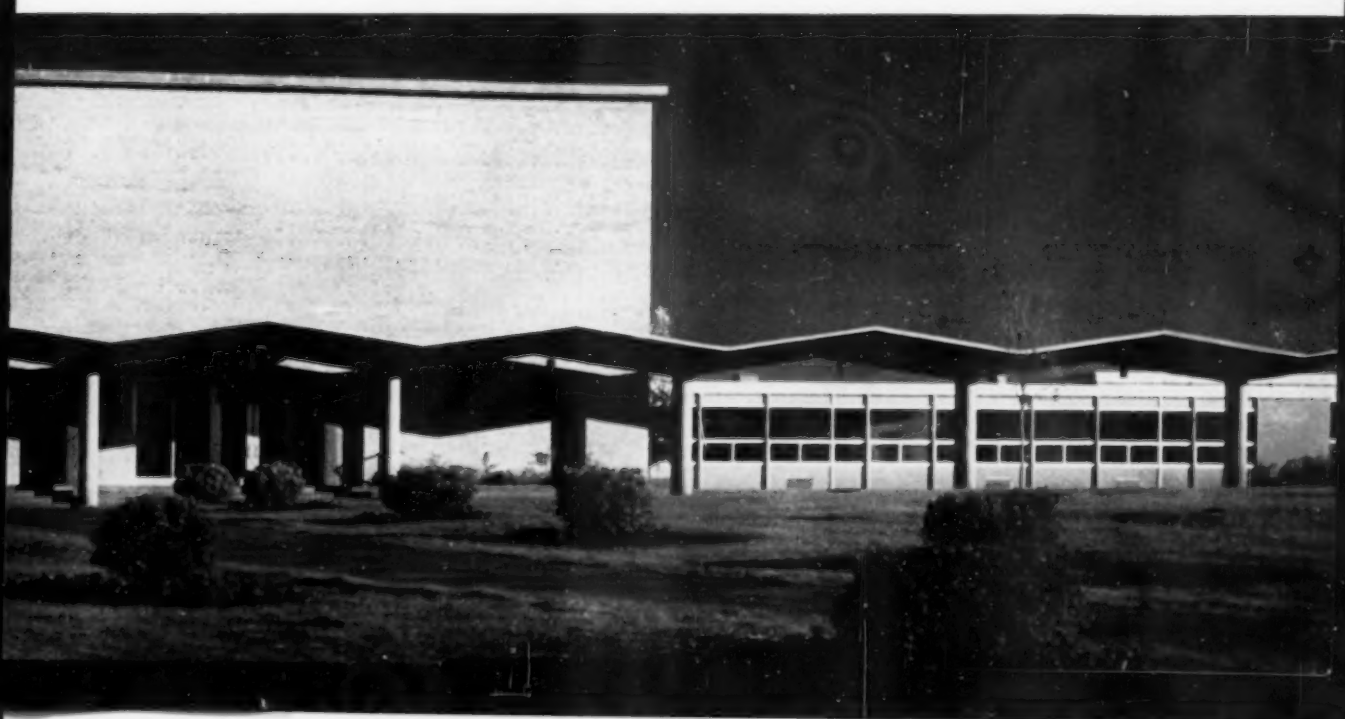


Molded acrylic plastic enclosures control light prismatically, eliminating glare.



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Styrene lighting louvers molded of

LUSTREX® PERMA TONE

55° Louvers of Lustrex perma tone by American Louver Company, Chicago, Illinois, in the IBM Datacenter, Chicago, Illinois.

Here's why Lustrex perma tone is the most popular ultraviolet light-stabilized styrene today.

You can create large areas of illumination with uniform light distribution, and good diffusion, that are strikingly handsome yet low in cost. Lustrex perma tone—exceeding IES-NEMA-SPI joint specifications for ultraviolet light-stabilized styrene—assures truly translucent whites, and a complete range of colors. It is light in weight for easy handling, installation and maintenance—and it is dimensionally stable.

New Impact Lustrex perma tone provides extra toughness and flexibility for snap-fitting to metal parts, high resistance to abnormal abuse, and lighter weight through thinner walls. Write for comprehensive technical report on both types of perma tone, including accelerated aging test results and other valuable data on styrene in lighting, to Monsanto Chemical Company, Plastics Division, Room 801, Springfield 2, Mass.

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MONSANTO INNOVATOR IN **PLASTICS**

JAMES R. CHAMBERS
IES President
1961—1962

FOR ITS LEADERSHIP this coming year, the Illuminating Engineering Society has elected as President a vigorous young business executive—James R. Chambers. A licensed professional engineer in the State of Illinois, and well known in the lighting industry for some 20 years, Mr. Chambers is Sales Manager, Lighting Products Division of Appleton Electric Company in Chicago.

Mr. Chambers' career in lighting goes back to 1941 when he joined the Overbaugh and Ayers Co., Chicago (then fluorescent lighting equipment manufacturers). With this company, as Factory Manager, he contributed much to the early design and production tooling for the then new fluorescent lighting equipment. During the war years of 1942-1943, he served also with the War Production Board as part of the Emergency Task Committee to produce a special steel substitute for lighting equipment. Prior to his present association with Appleton, Mr. Chambers was for 12 years with the Benjamin Electric Manufacturing Company, Des Plaines, Ill. In 1951 he was made Sales Promotion and Advertising Manager for that firm, succeeding the late R. W. Staud, a past-president of IES.

Throughout these years, Mr. Chambers contributed to numerous Society and industry activities. He served as editor of the industry digest magazine *Lighting Review and Digest*; he developed the guide "Layman's Language Lighting Design Manual;" he was a frequent speaker at industry and IES meetings, and a prolific writer of articles on lighting for both the trade and lay press.

Mr. Chambers brings to the national presidency of IES well-seasoned experience in Society administration. He has been a member of Council for the past consecutive seven years — as Regional Vice-President, Midwest Region, as Treasurer, General Secretary, and two years as Vice-President. In the Chicago Section he has long been an active committee member and local officer, serving as Section Chairman in 1953-1954. In national Society work, Mr. Chambers has been one of its most active members, serving with numerous IES committees as member and/or chairman. Some of these include: Chairman—Public Relations and Information Committee, Chairman—Industrial Lighting Committee, Advisory Board to the President, Finance Committee, Publications Committee, Lighting Service Forum, Progress Committee, Sustaining Members and Lighting Study Projects in Industry.

Mr. Chambers is a graduate of the University of Arkansas. He studied also at the Illinois Institute of Technology, and (for statistics and business administration) at the University of Chicago.

The business acumen and interest in Society progress which Mr. Chambers brings to his position as President of IES augurs well for the Society's further advancement in 1961-1962. ■

UNITED ENGINEERING CENTER

New IES Headquarters

ACTION taken in 1959 by a now-retired Council has come to gratifying fruition: The Society's Headquarters offices moved August 29, 1961 to the new United Engineering Center at United Nations Plaza, New York City.

Interest has been mounting, throughout the Society these past two years, in the many phases of this undertaking. The General Secretary's Report to be published in December IE will include details of administration, financing, and obligations, as well as benefits connected with this historic step in IES affairs. In addition, however, many details of this new building, and especially the Society's space in it, are of special interest to members. For them, and for the record, these are reported here.

Particularly gratifying is the reunion of IES with other professional engineering societies, after 24 years. The Society's first office, from about 1910 to 1937, was in the famous Engineering Societies Building at 29 West 39th Street in New York, which from 1906 housed most of the country's leading engineering groups. In 1937 the IES staff (then only five people) moved to the 21st floor of the New York Life Building at 51 Madison Avenue. Another move came in 1951 when the offices and staff (now 19 people) moved to 1860 Broadway.

The current move (with 22 staff) is much more than a change of address, however. It is a significant step for all of the societies involved. It brings together once again 19 major engineering groups, forming the largest and most important center of engineering in the free world. Further, these groups are not just co-tenants of a building, but are united colleagues in a united center of professional engineering, serving a combined membership of over 300,000 engineers. They jointly participate in the administration of the building; their members jointly raised much of the money to build it.

One of the most practical aspects of these united activities is the central services afforded to the 19 groups participating. A central switchboard, for example, will serve the entire building. An internal dialing system inter-connects all telephones within the building, so that any one of the 650 people(the combined staffs of all 19 organizations) may connect with any other by dialing the extension number. A central receiving area will simplify deliveries; an employee cafeteria will be shared by all; conference rooms and private dining rooms are available for all of the societies' committee and Council meetings. Under discussion is a IBM system for each Society's membership records.

ENGINEERING SOCIETIES LIBRARY

Probably the most significant joint undertaking is the great Engineering Societies Library. With its move into the United Engineering Center, the Illuminating Engineering Society shares with ten other engineering societies the responsibilities as well as the privileges of this remarkable institution.

A department of the United Engineering Trustees Inc., the Library was begun more than 50 years ago by combining the libraries of ASCE, AIME, ASME, and AIEE. Its contents are metic-

IE is indebted to *Civil Engineering*, official publication of the American Society of Civil Engineers for description of the United Engineering Center Building details.

Fact Sheet—United Engineering Center

OWNED AND OPERATED BY:	United Engineering Trustees, Inc. (Established in 1904, consisting of 15 members, three from each of the five founding societies).
LOCATION:	United Nations Plaza (First Avenue), occupying full block between 47th and 48th Streets.
SIZE:	Twenty stories (283 feet) high, 260,000 square feet of floor space, 18 stories office space, two of mechanical equipment. Tower section 69 feet by 139 feet.
APPEARANCE:	A slim tower of glass, stainless steel and limestone rising from a broad two-story base of glass and stone.
FACILITIES:	Office space of (currently) 19 groups; meeting room for 400 persons, which can be subdivided into three smaller rooms; exhibit area of 6,235 square feet; employees' lounge, dining rooms and cafeteria, to seat 250 situated around landscaped sunken court; Engineering Societies Library and Engineering Index.
REPRESENTATION:	Staffs employed by 19 organizations, totalling approximately 650, serving total membership of about 300,000 professional engineers.
ARCHITECTS:	Shreve, Lamb and Harmon Associates.
STRUCTURAL ENGINEERS:	Seelye, Stevenson, Value and Knecht.
MECHANICAL AND ELECTRICAL ENGINEERS:	Jaros, Baum & Bolles.
GENERAL CONTRACTOR:	Turner Construction Company.
COST:	$12,000,000.

ulously selective. Many thousands are up to the minute, and some items bear the imprint of past centuries. One book dates back to 1473.

The societies moving into UEC have added their engineering books and technical papers. The Library will henceforward receive all of the IES technical engineering publications currently and automatically.

In its new home in the United Engineering Center, ESL has an eventual capacity of 255,000 volumes. That capacity will undoubtedly be reached some day. At present the Library has a tremendous reservoir—180,000 volumes, 27,000 maps, 10,000 indexed bibliographies. It files many thousands of technological papers. Currently, the Library receives 3400 periodicals and other serial publications from 45 countries and in 21 languages besides English.

The Engineering Societies Library has a staff of 30 persons. Half of these are trained librarians with technical training and experience, and a knowledge of at least a dozen languages. The other 15 are clerical assistants. Translations of engineering and technical articles are made from all languages into English by "consultant" translators who are familiar with engineering. All translations are reviewed by a member of the Library staff for accuracy and correct English idiom.

Immediately available services of the Library are free. Where translations are requested, or photocopying or microfilming of Library material, or other special services, moderate fees are charged.

Some 700 books a year are reviewed by the staff. These reviews are made available to the editors of all the journals of the supporting societies, which now include IES.

The Engineering Societies Library is located on the second floor at UEC, and reached by a special elevator. Its reading room can accommodate 81 people. Its cataloging system, the protection of its volumes against humidity, its stacking plan and many other facilities are the result of decades of experience, and represent the best modern practice in every way. With its new location just across the street from the United Nations, it is expected that the UN will find it of important service.

ENGINEERING INDEX

Closely allied to the famous Engineering Societies Library, though a separate entity, is the Engineering Index Inc. Through cooperation between these two organizations, engineers and industry have services unmatched anywhere. The service indexes all of the material contained in the Library, including articles contained in the 3400 periodicals received by the Library. Each reference is annotated and all are published in a daily card service and subsequently in a cumulative annual bound volume. The Engineering Index is located alongside the Engineering Societies Library on the second floor of the new building.

UEC BUILDING

The United Engineering Center building has been constructed at a cost of about $12 million. Most of the money has come from the contributions of many thousands of individual engineers, augmented by substantial gifts from industry. Funds

were raised for the building—and its over-all planning and construction supervised—by the United Engineering Trustees, Inc. This control group was established in 1904 to administer the old Engineering Societies Building, then in a planning stage, and has continued since to control the jointly owned and operated facilities such as the building and the Engineering Societies Library. Authority is vested in a board of fifteen, three from each of the five Founder Societies.

In keeping with the style of the United Nations area of which the new building becomes a part, only a low structure covers the block front from 47th to 48th Streets while a tower, which houses society offices, rises to a height of 20 stories. The entire building is set back 27 feet from the 47th Street side, creating a paved and landscaped terrace, which is raised slightly above sidewalk level.

The building is an imposing structure of glass and limestone rising from a granite base. Stainless-steel mullions, column covers and window frames accentuate the slate-blue color motif used in the glass spandrels for the full height of the building. The same gray-blue is carried into the structure in the lower lobbies and the public rooms throughout the structure.

Most of the facilities serving all tenants of the building and the public are contained in the low block, which covers almost the entire property of 37,000 square feet. This block is two stories high on the 47th Street side and three stories on 48th Street because of the slope of the United Nations Plaza. The block is pierced by an interior court, open to the basement level for daylight.

The main entrance to the structure is from the 47th Street terrace into a lobby walled in Georgia Cherokee marble, with floors of bluish gray terrazzo. On the United Nations side of the lobby is an Exhibition Hall. Here it is planned to have changing displays illustrating the many contributions made by all the branches of the engineering profession to world progress. The Exhibition Hall has an area of 6235 square feet with a ceiling height of 15 to 22 feet. Glass from floor to ceiling, the full length of the United Nations Plaza side, provides a show window for the passer-by. Provision has been made for flexibility in the lighting displays; (a full description of this lighting design is not presently available).

On this floor also is a meeting room for 400 people, which can be subdivided, by moving partitions, into three rooms of equal size. Special provision is made for the presentation of illustrations from a projection booth.

From the lobby four automatic elevators will serve the needs of some 650 people (exclusive of building staff) who occupy the building. Space is provided for two more elevators, which will be required when additions are made to the structure. Corridors lead to private dining or conference rooms with capacities varying from 20 to 100 persons. The private dining rooms are served by a pantry connected with the main kitchen below by means of an electric dumb-waiter and a stairway.

Below the main floor, but on the 48th Street level, is an employees' lounge and dining room seating 250. This is placed around a landscaped sunken court. The kitchen, service entrance and off-street truck dock are on the 48th Street side. Also on this level are the central switchboard, building maintenance shops, and the like. A small sub-basement is under the maintenance area.

The 19 individual societies have their offices in the 69- by 139-foot tower section. Each group has been allowed to take as much space as it wishes at a cost of $4.50 per square foot. This figure is planned to take care of maintenance and to accumulate a depreciation reserve. At present, the space taken by individual groups varies from one room to three complete floors of the tower. IES will occupy the eastern half of the ninth floor, the other half of this floor being occupied by AIEE Publications Sales Department. Two floors in the building, the 15th and 16th, are not finished and are available for expansion.

Other provision for expansion is in a planned connecting structure on the northwest side of the building over the Library and book stacks, where as much as 8500 square feet can be added per floor from the third through the eighth floors, and 6000 square feet per floor from the ninth through the twelfth floors.

Since windows are not movable and there are no ledges, all exterior cleaning and maintenance for the tower section is done from a scaffold hung from the roof. A steerable rubber-tired carriage moves around the periphery of the roof to support a scaffold that covers two windows—10-foot width—and is lowered on cables to allow maintenance men to work. The rig is guided and held at the building by a device that clamps around the projecting mullion between the windows. Electric-powered winches on the scaffold raise the unit about 18 feet per minute. The scaffold is moved to a new location by free travel of the carriage on a paved area on the roof. Electric power for the unit comes from cables to roof outlets.

Air Conditioning

A striking feature of the building's mechanical system is its integrated ventilation control system. The maintenance man can sit at a data center,

Groups Occupying the United Engineering Center

GROUP DESIG.	FULL NAME	YEAR FOUNDED	MEMBERSHIP MID-1961	UEC FUND QUOTA	N. Y. STAFF	FLOOR LOCATION
ASCE	American Society of Civil Engineers	1852	48,000	$800,000	87	17, 18
AIME	American Institute of Mining, Metallurgical and Petroleum Engineers	1871	37,150	500,000	55§	13, 14
ASME	American Society of Mechanical Engineers	1880	49,500	800,000	140	5, 6, 7
AIEE	American Institute of Electrical Engineers	1884	55,000	900,000	95	9, 10, 11
AIChE	American Institute of Chemical Engineers	1908	22,000	300,000	45	12
	(The above are known as the Founder Societies)					
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	1894	17,800	250,000	40	4
MECNY	Municipal Engineers of the City of New York	1903	660	†	1	3
IES	Illuminating Engineering Society	1906	9,900	75,000	22	9
AICE	American Institute of Consulting Engineers	1910	275	25,000	2	3
AWS	American Welding Society	1919	12,800	60,000	38	8
WRC	Welding Research Council	1935	*	*	7	8
AIIndE	American Institute of Industrial Engineers	1948	9,700	70,000	7	4
SWE	Society of Women Engineers	1950	470	7,000	1	3
EIS	Engineering Index Service	1884	*	*	30‡	2
UET	United Engineering Trustees	1904	*	*	8	3
ESL	Engineering Societies Library	1913	*	*	25‡	2
EF	Engineering Foundation	1914	*	*	2	3
ECPD	Engineers' Council for Professional Development	1932	10 groups	*	3	3
EJC	Engineers Joint Council	1945	11 groups	*	15	3

* No direct membership and no group quota.
† MECNY did not have an assigned quota but contributed about $2,500.
§ AIME has 13 at its Society of Petroleum Engineers Office in Dallas, Texas.
‡ These have additional part-time employees.

located in the basement, and graphically view the operation of the heating and air conditioning systems, and control them, in any part of the building. He can project color-graphic slides on a view screen to note temperatures and to reset equipment. Stop buttons with pilot running lights are provided for each fan. Very efficient operations are afforded from this automatic control of mechanical equipment, fans, pumps and air conditioning equipment.

Two systems will heat and cool all space in the United Engineering Center. Air conditioning equipment for the office tower, together with a water-chilling plant serving all air conditioning in the building, is located in the mechanical rooms above the top office floor. Another mechanical equipment room, at cellar level, contains apparatus for the conditioning of the public spaces (the Engineering Societies Library, meeting rooms, dining spaces and the Exhibition Hall).

The general air conditioning of the interior of the structure comes from an overhead duct system. The system serving the public area is divided so that any of these spaces can be air conditioned without requiring other spaces to be heated or cooled.

The exterior offices make the first use in a large building of the By-pass Weathermaster units made by the Carrier Corp. Approximately 370 of these are installed under windows. The self-contained unit permits precise control of room temperature by the occupant.

Electrical Facilities

Electrical services for the United Engineering Center are provided from the Consolidated Edison system at 265 or 460 volts through a single service takeoff. Office lighting is from fluorescent recessed troffers, designed to provide a maintained average of 75 footcandles in open spaces. An exception to this is the Illuminating Engineering Society space, where a different lighting system has been installed to provide 200 footcandles (see page 593 for details). All fluorescent lighting in office areas is operated at 265 volts. Incandescent lighting and receptacle plugs in office areas are at 120 volts from dry-type transformers. A double under-floor duct system for electricity and telephone lines is provided in all office space to permit maximum flexibility in the rearrangement of these areas.

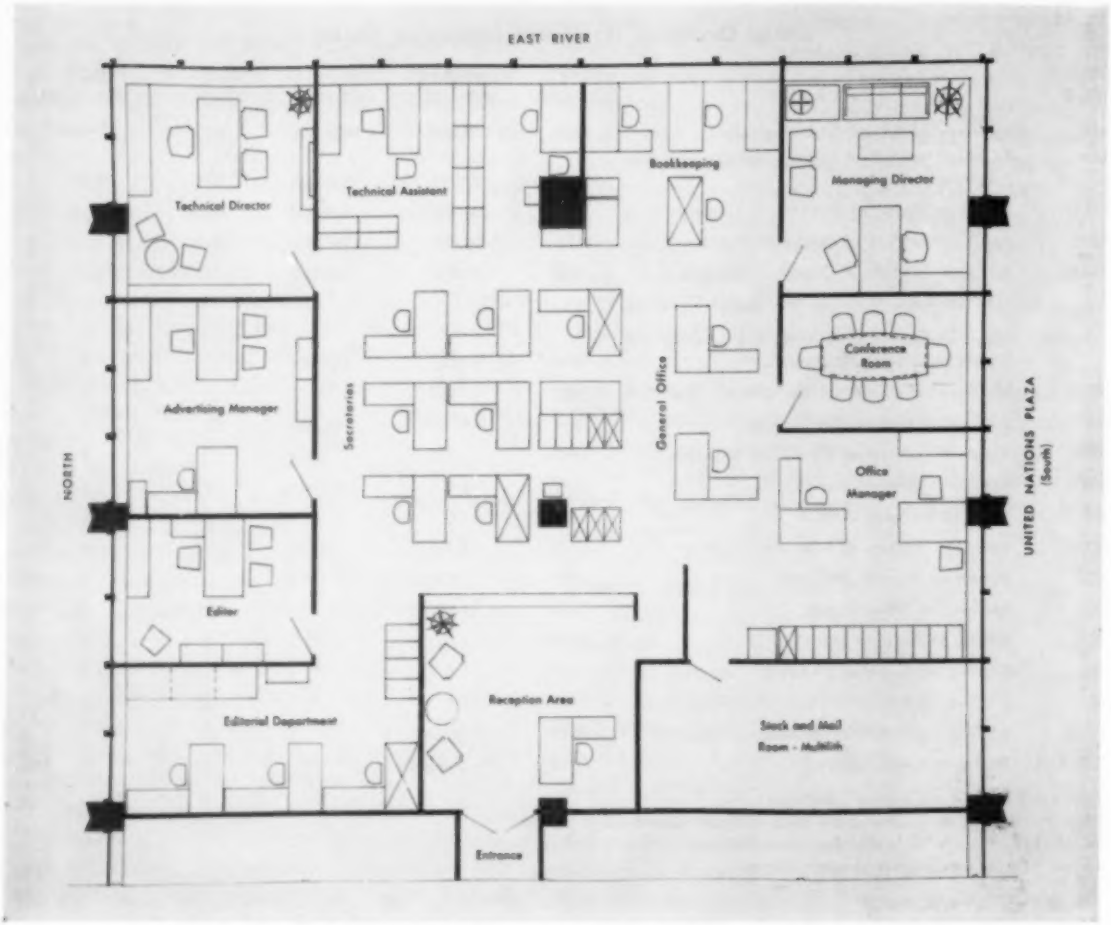


Figure 1. Floor plan of IES Headquarters. X's indicate space for future expansion.

Operation and Maintenance

The United Engineering Trustees, Inc. will manage, operate and maintain the new building. The operational housekeeping at UEC has been contracted to Allied Maintenance Corp. They supply and supervise cleaning, elevator operation and custodial personnel. Mance Associates will maintain and operate mechanical, electrical and air conditioning facilities and are responsible for preventive maintenance in the structure.

Food services are supplied by Schraffts, Inc., using facilities made available to them. Prices in the cafeteria are expected to be about 60 per cent of that in their public restaurants, with service limited to employees in the building.

IES HEADQUARTERS

A fresh start in a completely new building has afforded IES its first good opportunity to design its entire office space for maximum efficiency of its own particular operations. Starting with a to-scale floor plan months before the building was completed, an office layout (see cut) was developed from a study of these operations by the officers and senior staff. Essentially this plan provides for the integration of all operations, and easy routing around the total area. The layout also provides flexibility for future growth. The desks shown crossed with x's on the floor plan do not exist, but represent space for possible increase in staff.

The layout provides for a small conference room seating eight to ten people. Senior staff's offices also have been designed to accommodate small meetings of three or four people.

Interior design, colors and furniture arrangements are to a concept developed by Wilbur Riddle, architect and lighting designer for The General Electric Co., Nela Park, Cleveland, Ohio. Cooperating with him was Richard Kelly, noted New York designer and lighting consultant, who will also carry out the construction details of the specially designed and lighted reception area.

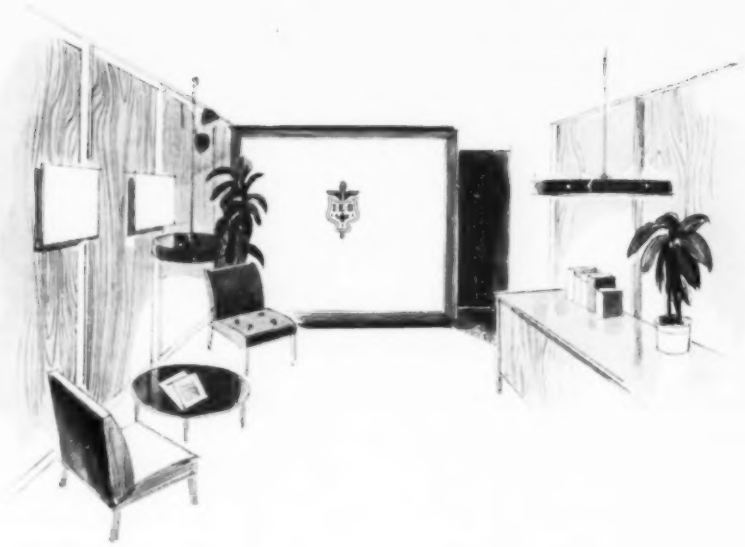


Figure 2. Artist's conception of IES reception area. Direct-indirect lighting is supplied by two translucent suspended, decorative fixtures, each equipped with 12 PAR38 lamps, six uplights and six downlights. Shielding is from special black louvers.

All of the office furniture is new. Sold to others and left behind was the conglomeration of dark desks, tables and floating typewriter stands. The new office furniture replacing this has been selected (a) to meet Recommended Practice reflectance limits and (b) to incorporate features of maximum service to each person's needs. Special card trays in a membership clerk's desk, for example, now accommodate index cards for quick and easy use of them. No longer will large pieces of art work in "Editorial" be propped against the wall. Individual units forming credenzas or work areas contain the number of drawers, files and/or shelves determined by consultation to best serve that operation. Hidden hooks on the desks take care of the girl's hand-bags.

Color of the all-steel desks, files credenzas and accessories (letter trays, waste baskets) is a high-reflectance bamboo yellow, with light biege desk tops. Contrasting with this are russet-colored chairs. Floors in the general office area are hard surfaced vinyl asbestos tile of a light fern green color, specially chosen to meet Recommended Practice. The four private offices, conference room and projected reception area are carpeted. The carpeting is a custom color of a white-black-green "salt and pepper" design, to meet IES recommendations. Office partitions are all metal, of a very light green.

A color change of pace occurs in two of the private offices. Here, in the offices of the Managing Director and Technical Director, office furniture is all wood, in natural finish oil-rubbed walnut. Visitors chairs are upholstered variously in russet, opal white, and black, and in one office a sofa repeats the bamboo of the general office.

LIGHTING FOR IES

Throughout the office area in the United Engineering Center, lighting has been designed for 75 footcandles. This obviously would never do for IES. To meet its own Recommended Practice for Office Lighting in every respect, IES has installed a different system for its general office space, designed to provide 200 footcandles, and lighting of such quality as to have a minimum of shadow and glossy reflection from papers, inks, and pencil marks. Additional air conditioning was also installed to compensate for the additional load.

Around the perimeter (window) area, for the most part private offices, it was required by the building that the regular (75-fc) troffer system be retained. Throughout the large center portion of the space, however, a ceiling system has been installed to provide 200 footcandles. This is essentially a large area "floating panel" semi-indirect luminaire. Continuous, plastic-shielded channels on two-foot spacing are suspended from a ceiling cavity, flush with the surrounding acoustical ceiling. These lamp sections are equipped with extra-high-output 1500-ma lamps, 45 of the 96-inch and 15 of the 72-inch lamps being required. Ballasts are housed in cross-section channels, forming a grid pattern.

Most of the light from this system is directed upward into the ceiling cavity, where it is diffused downward through plastic grills. Between the lamp sections are placed plastic louver panels of a cream color, having 3/8-inch cells. This serves to "filter" the reflected indirect light and to conceal the beams and white plaster of the natural ceiling. The effect

is of a luminous ceiling flush with the acoustical ceiling of the perimeter (troffered) area. At press time (October 1) the area was still a shambles from moving operation and photographs were not feasible. It is expected that pictures of the Society's new quarters, meeting office practice in every detail, may be shown in a subsequent issue.

Reception Area

The art of illumination, as well as the science, was not overlooked in the lighting design for the Society's Headquarters. In fact, esthetic application will form the visitors' first impression as he steps into the reception area.

Under the direction of Richard Kelly, this area is being developed to be an example in decorative lighting and at the same time to be a functional working area. The receptionist, at a large modern walnut desk (with light beige top) doubles as typist and membership assistant.

At present not yet constructed, it is planned that this area will be carpeted and pleasantly furnished with planter, low table, and visitors chairs of walnut and black Naugahyde. The steel walls will be covered with natural finish walnut paneling. Backing one wall, on the general office side, will be a long closet with sliding doors for staffers' hats and coats.

Lighting over the receptionist's desk and "coffee table" will be from custom-built suspended units, shielded by specially designed black louvers. Lighting will be direct-indirect from incandescent PAR-38 lamps, six lamps up and six down in each unit. The up lamps and down lamps will be on separate dimmers. On the left wall it is planned to feature enlarged illuminated transparencies of current national Applied Lighting Competition winning installations.

Pièce de résistance of this decorative-lighting area will be the center wall, facing the visitor as he enters Headquarters. This will be a luminous panel framed in walnut, in the center of which will be suspended the blue and gold shield of the Society's emblem. Double diffusing elements of first, Fiberglas and then a frosted plastic panel, will shield the lighting for this luminous wall. This will consist of 8-foot cold cathode lamps of four different colors (red, blue, green and amber) placed vertically on close centers. Each color will be on a separate dimmer so that a great variety of color effects may be achieved.

IES members are cordially invited to visit their new Headquarters. The accompanying map may guide them through New York's transportation system to the new United Engineering Center at United Nations Plaza.

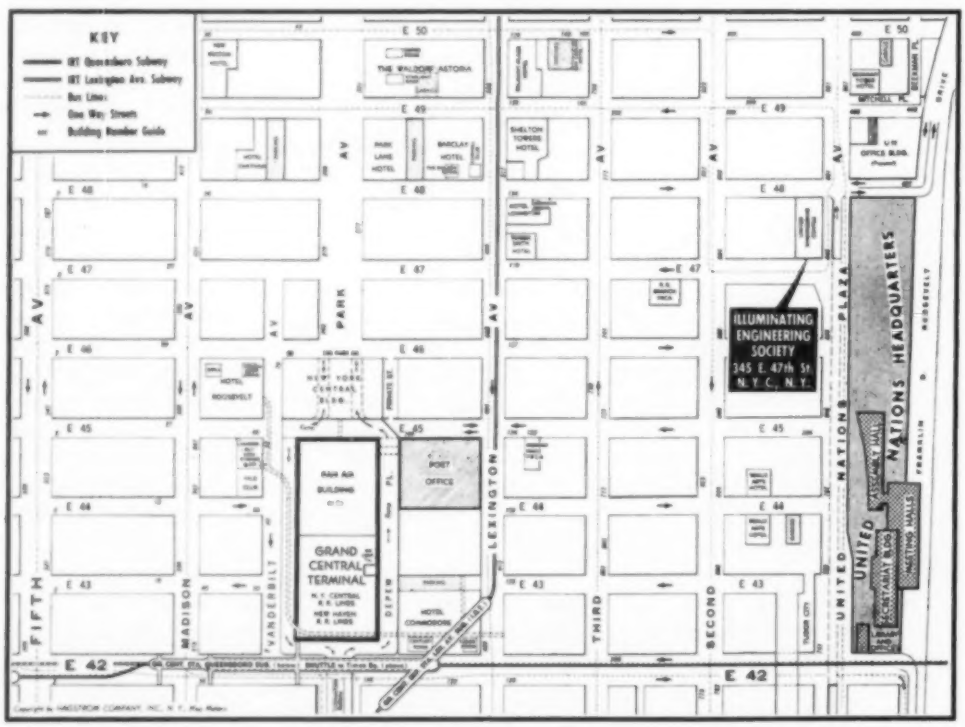
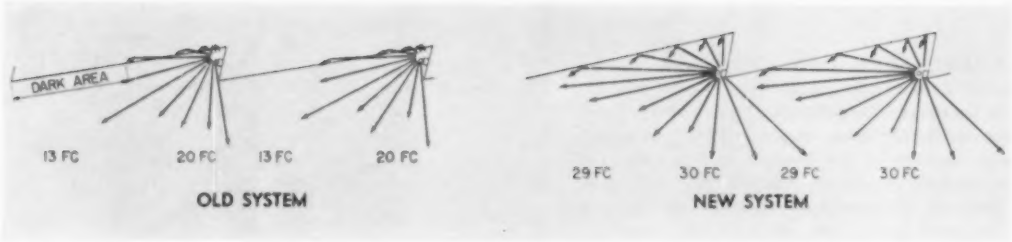


Figure 3. Map showing transportation facilities and hotels in UEC vicinity.



Engineered Lighting = ■ HIGHER LEVELS ■ UNIFORM DISTRIBUTION ■ NO EXTRA COST

DIFFERENCES in illumination levels and light distribution in the two lighting systems shown in cross section above are graphic demonstrations of the value of engineered lighting. Both systems are bowling center installations using continuous rows of eight-foot fluorescent lamps in saw-toothed ceiling construction. But, the installation shown in the drawing at right (Aero Bowl, Phoenix, Ariz.) has been engineered for maximum utilization of light.

In a considerable number of saw-toothed ceiling systems, construction of the ceiling is such that, for adequate support, fixtures must be mounted close to the ceiling. As seen from the drawing at left above, light from these units is trapped in the corner of the ceiling, producing alternating dark areas and hot spots, and differences of as much as 70 per cent in lighting levels along the length of the bowling lanes.

With the simple change in ceiling construction and lamp placement shown in the drawing at right above, identical lighting units can produce 50 to 125 per cent more illumination and uniform distribution along the lanes from foul line to pins. This substantial improvement in lighting—at no additional cost—is the result of an increase in the distance and angle between the lower edge of the saw tooth and the ceiling, and placement of the fixtures at the lower edge of the saw tooth. As seen in the drawing, this arrangement spreads the upward component of light evenly over the entire ceiling, which now acts as an indirect light source, reflecting light back to the bowling lanes and minimizing ceiling hot spots. The light distribution, covering an area of approximately 45 degrees behind the fixtures (visible on side wall in photo), assures uniformity of illumination on bowling lane surfaces between rows of fixtures. Measured lighting levels vary only one footcandle—from 30 footcandles directly beneath units to 29 footcandles between rows.

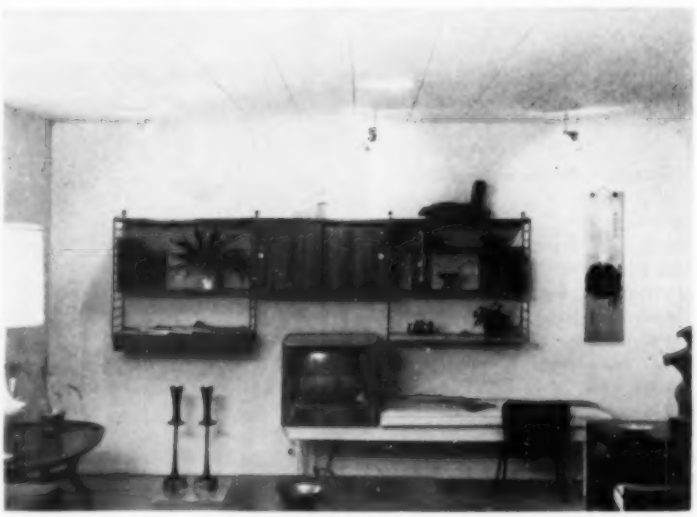
Lighting design, by Jim Russell, Arizona Public Service Co., Phoenix, was second in the Arizona Section's 1961 Applied Lighting Competition.

Uniform illumination levels along entire length of these bowling lanes are achieved from a carefully designed saw-tooth ceiling system. Localized lighting over bowlers' benches is from two- by four-foot troffers each equipped with four 40-watt fluorescent lamps and plastic diffusers.

CHILDREN'S AREA (right and facing page). Seven different lighting units in this area can be used in a variety of combinations to provide up to 25 footcandles for work or play. Two fluorescent strips at the edge of the dropped ceiling area and the recessed incandescent unit near the desk provide general illumination. Another fluorescent strip mounted behind the offset ceiling (not visible) reflects off the back wall to increase the general illumination level. Two R30 spots behind the dropped ceiling highlight the children's drawings on the back wall. Accent lighting for the sculpture on the cabinet (photo at right) is from a controlled aperture downlight constructed of a section of tubing with light source mounted above it. The lighted cabinet provides floor-level illumination to balance the low-level furniture.

WORK AREA. Soffit lighting spreads 65 footcandles of diffuse illumination over desk top, while concealing plumbing and heating duct work. Diffusing panel of fireproof Fiberglas fabric stretched over wood frame is light weight, and easily removed for maintenance.

ADULT'S RECREATION AREA—for noncritical seeing tasks is lighted with a combination of recessed ceiling units, portable lamp and R30 spots. The three recessed units—do-it-yourself fixtures—were fabricated by cutting the center out of the ceiling tile and stretching Fiberglas fabric over the opening for diffusion. A gallon can, split open, acts as a reflector. Junction box is mounted between rafters on subflooring and adapted with a ceramic socket which houses a 150-watt incandescent lamp. Adjustable spots used to highlight art objects and provide wall lighting are R30 floods mounted in photoflood sockets.



DO-IT-YOURSELF LIGHTING FOR FAMILY ROOM

By JOHN L. URBANK

GOOD LIGHTING and practical designing go hand in hand. Neither need be a costly adventure, but both must be carefully planned and executed.

As an interior designer, my aim in this project was to decorate and effectively light the basement of my home on a limited budget, and to incorporate and develop some of my own lighting techniques. This "family room," or whatever its latest name, evolves into a little community center shared by children and adults. The room is divided into three areas: *adult's relaxation center*—with accommodations for napping, light reading and television viewing; *children's play area*—for toys and noise and close viewing activities; *work area*—for comfortable and convenient paper work or hobbying by members of both generations.

Lighting conditions shown in the accompanying illustrations are the result of a total count of 37,715 lumens, or 87 lumens per square foot of area. Illumination level for the entire area averages about 30 footcandles, varying, of course, in each individual area.

High reflectance materials for floor, walls and ceiling aid in making maximum use of the light output. Diffuser applications control the quality of light. Fiberglas fabric diffusers add a slight orange tint to the light for warmth and glow, while plastic diffusers (which do not change the quality of the light) permit maximum transmission without creating a hot spot of brightness. Other control factors are the use of restricted aperture openings, polished reflectors and directional lamps. Individual switching controls for the 20 lighting units permit a wide variety of illumination levels.

From a decorative angle, the interplay of incandescent and fluorescent colors and the diffused light provide an interesting foil for the furnishings. This blending of lighting and interior design has all been accomplished with standard equipment and a modest budget.

AUTHOR: Louis S. Urbank Co., Interiors, Detroit, Mich. This installation won first prize in the Detroit Section's ALC.

"Split-level" lighting in the main lobby separates the reception area from the elevator lobby (background). Light from continuous rows of deluxe cool white T12 lamps on 30-inch centers filters through a one-way dropped lattice ceiling to provide 10 footcandles in the reception area. Luminous ceiling system in the elevator area produces 80 footcandles on the white mosaic walls and company trademark.

Prestige for Corporate

ONE OF THE most outstanding features of the new prestige office buildings punctuating the North American landscape is the use of lighting as an architectural adornment. It is a rare lobby or executive floor in these new buildings which does not employ a distinctive lighting system to spell "prestige." This concern for lighting has penetrated to the general office floors too. Here, illumination systems may not be esthetically distinguished but, increasingly, they are being designed to IES recommendations to provide visual comfort and improve worker efficiency.

New Toronto headquarters of Union Carbide of Canada, housing the administrative staff of the head office and the company's six divisions, was designed to be a symbol of Union Carbide in Canada. Throughout the building, lighting is applied to enhance the power of the symbol.

The office space which occupies the major portion of the building is lighted with two types of illumination systems—a troffer system on the general office floors and luminous ceilings for the executive floors. On each floor both office space and corridors are lighted with similar systems for unity of design.

Troffer System

Since the building is designed on a five-foot module, offices in the general area vary in size from 10 by 15 feet, 15 by 15 feet and 15 by 20 feet for private offices, to 15 by 60 feet up to 60 feet square for general office space.

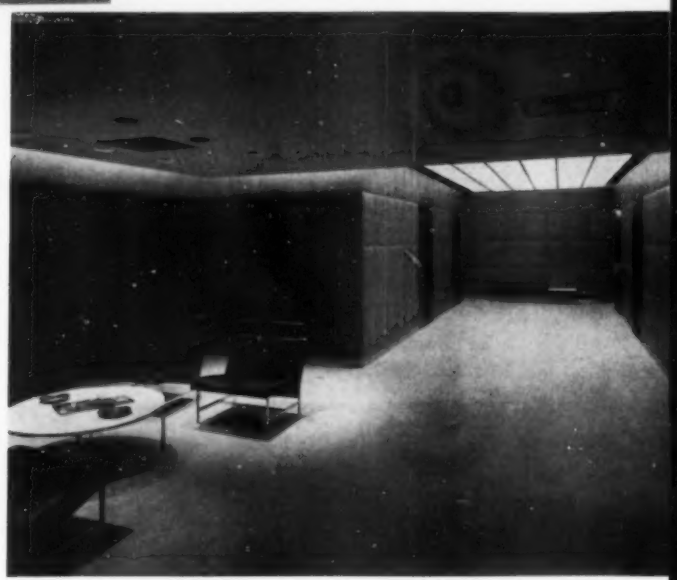
The initial lighting plan, to fulfill the client's request for lighting levels of 100 footcandles in all office areas, specified a four-lamp troffer in each five-foot module. However, the lighting load of eight watts per square foot produced by this system (and the attendant excessive air conditioning costs) forced the use of two-lamp troffers, mounted on five- by five-foot centers.

The unit selected is a parabolic Alzak troffer with low brightness louvers providing 30- by 42-degree shielding and reported to conform to the glare limiting factors of the scissors curve.

To achieve maximum utilization of the light output from these units, careful attention was given to the use of high reflectance surfaces

Typical general office area. Two-lamp, low brightness Alzak troffers with 30- by 42-degree shielding are mounted on five- by five-foot centers, conforming to the building module. A comfortable level of over 100 footcandles is produced by the use of high reflectance surfaces throughout the offices.

Recessed downlights in a floating ceiling delineate the executive floor reception area, while cove lighting, accenting the leather trim, leads the eye around the corner to the elevator lobby. Luminous ceiling seen here in the elevator area is used throughout the executive floor, in corridors as well as offices.



Lighting a Symbol

throughout the offices. Final specifications provided for: ceilings, 80 per cent; walls, 70 per cent; floors, 40 per cent; desks, 80 per cent; and office equipment, 60 per cent.

Since the coefficient of utilization varies in accordance with room size, lighting levels from the troffer system are higher in the large interior spaces than in the small perimeter offices. Measurements after ten months showed 70 footcandles in a 10- by 15-foot office, 90 footcandles in a 15- by 15-foot office and 100 footcandles in a 15- by 60-foot area. During normal working hours, however, daylight, controlled by translucent vertical louvers, increases the lighting level to more than 100 footcandles in all perimeter areas. An additional 5 to 10 footcandles penetrates into the interior offices through glazed partitions.

Throughout the office area colored screens, end walls and chairs are used to achieve definition of space and decorative relief.

Luminous Ceiling System

On the executive floors, lighting from low-brightness luminous ceilings is designed to blend with and enhance the luxurious modern decor. Glass diffusing panels, ¼-inch thick and with a ¾-inch bearing on all sides (required by city building laws) are supported by a grid of stainless steel

channels arranged on approximately 30-inch centers. The grid is sufficiently deep to provide both comfortable shielding and decorative variation in the potentially bland expanse of luminous ceiling. Continuous rows of 40-watt rapid-start fluorescent lamps, mounted 18 inches above the diffusing panels on 24-inch centers, produce from 80 to 100 footcandles on the work plane, depending upon office size and reflectances. Panel brightness is under 200 fL. The use of deluxe cool white lamps (in preference to warm white) retains the opal white hue of the diffusing panels and provides good color rendition at this high level of illumination.

Arthur W. Henschel, Shore & Moffat, Architects and Engineers, Toronto, designed the lighting for this distinguished Canadian office building. The design was entered in the Toronto Section's 1961 Applied Lighting Competition.

Luminous ceiling in executive vice-president's office uses deluxe cool white lamps on two-foot centers above ¼-inch opal glass diffusers supported by a stainless steel grid. Lighting level on the desk in this office is 80 footcandles; other offices on the executive floor have levels up to 100 footcandles from the same system. Note vertical louvers used for control of daylight.

Regressed luminous element above board room table, controlled by low-voltage switching, provides a range of lighting levels between 30 and 100 footcandles. Forty 40-watt T12 lamps are mounted 12 inches above the diffusing panels. An anodized aluminum grille floating six inches below the ceiling (not installed at time of photograph) provides low brightness shielding. Around the perimeter of the room, staggered two-lamp coves direct a wash of light on the walnut and blue leather panelled walls.

Figure 1. General reading room has low brightness air-handling troffers at two different ceiling heights. Illumination on desks of study cubicles is 80 footcandles.

At Case Institute of Technology, Cleveland, lighting for the Library and Humanities Center conforms to illumination principles taught elsewhere in this institution.

NEW LIBRARY

THE LIGHTING of Case's new six-story building offered an interesting "field project" to the school's illumination expert, Professor Russell C. Putnam. This exercise in application also promised a number of challenges. The first of these was from the nationally-rated consultants on library planning who stated that 35 footcandles was all the illumination necessary for libraries. However, after a short course in illumination principles and a practical demonstration of reading under different levels, this group reevaluated its stand.

The lower three floors of the building are devoted to library facilities; the upper three contain offices, classrooms and seminar rooms for the Humanities Department. On the fourth floor there is also a display area for art exhibitions.

A general reading room, typical of those on both the second and third floors, is shown in Fig. 1. Note that two ceiling heights are involved; one ten feet, the other eight feet. This results in a variation in illumination level, from 60 footcandles for the more general reading area, to 70 to 80 footcandles on the desks of the study cubicles. Luminaires are low-brightness troffers, some of which are of the air-handling type for air conditioning.

For the book shelves, Fig. 2, the application problem was to furnish as even a distribution of light as possible on the spines of the books, and at the same time retain reasonable relationship between vertical and horizontal illumination. With only 30 inches between book stacks, the resultant lighting is quite remarkable considering that only one 40-watt fluorescent lamp is used in that luminaire behind a plastic lens. The illumination values range from a vertical reading of 55 fc on the top shelf, to a vertical reading of 17 fc on the lower shelf, with a corresponding reading of horizontal illumination of 55 fc at 30 inches from floor.

Figure 2. Titles of books may be easily seen. Illumination on vertical plane on top shelf is 55 fc, ranging to 17 fc on bottom row. Corresponding horizontal illumination is 55 fc at 30 inches from the floor.

Figure 3. Three types of luminaires, for general illumination, wall illumination and highlighting, are used in gallery. Deluxe warm white fluorescent lamps and incandescent spots assure good color rendition.

Another interesting problem involved the art display section on the fourth floor, where the vertical lighting on the paintings is of prime importance. Fig. 3 shows how the problem was solved by the use of three types of luminaires; one to give general lighting of the area, another to give a wash of light over the walls to illuminate the paintings, and third, to use incandescent spot lights and bring out highlights, or to emphasize certain paintings. For good color rendition, and to harmonize with the incandescent spots, the fluorescent lamps in this area are deluxe warm white 25 to 35 footcandles on vertical surfaces with 30 footcandles on the horizontal surfaces in the room. The ceiling luminaires for the side wall illumination are equipped with parabolic reflectors and angled baffles for the vertical illumination.

The problem in the seminar rooms (Fig. 4) was to provide lighting that would be suited to several purposes such as classroom instruction, informal discussion or student lounge. This was accomplished by a combination of general lighting and wall lighting. For the classroom activity both types of lighting are used, the wall lighting also serving to illuminate the chalkboard. For discussion around a table, typical of seminars, the general illumination from the ceiling luminaires can be used, while the wall units alone would give a more relaxed atmosphere for lounge use. With all light on, the illumination on the table ranges from 80 to 100 footcandles.

Another interesting problem was posed by many of the offices on the fifth and sixth floors. These offices have no finished ceilings and all the air ducts and other building utilities are exposed (Fig. 5). The solution was to paint the ceiling and all the ducts a flat white and to create the illusion of a luminous ceiling. The suspended luminaires used have such carefully controlled brightness and light distribution that a very close relationship between ceiling and luminaire brightness is obtained. The effect is quite similar to that of a luminous ceiling. Illumination averages 60 footcandles.

The executive office shown in Fig. 6 required a luminous ceiling which introduced still another problem. The low mounted ceiling is only eight feet high, causing acoustical difficulties. This is taken care of by acoustical perforated baffles with a Fiberglas filling. Lighting level ranges from 80 to 100 footcandles.

The success in meeting these challenges was obtained through the whole-hearted cooperation of the architects, Small, Smith, Reeb and Draz; with the consulting engineers, McGeorge, Hargett Hoag, Cleveland; and the representatives of the fixtures manufacturers.

Lighting design is by Professor Russell C. Putnam, Case Institute of Technology, and Richard G. Zacharias, McGeorge, Hargett and Hoag, consulting engineers, Cleveland, Ohio. The installation was presented at the Cleveland Section Applied Lighting Competition.

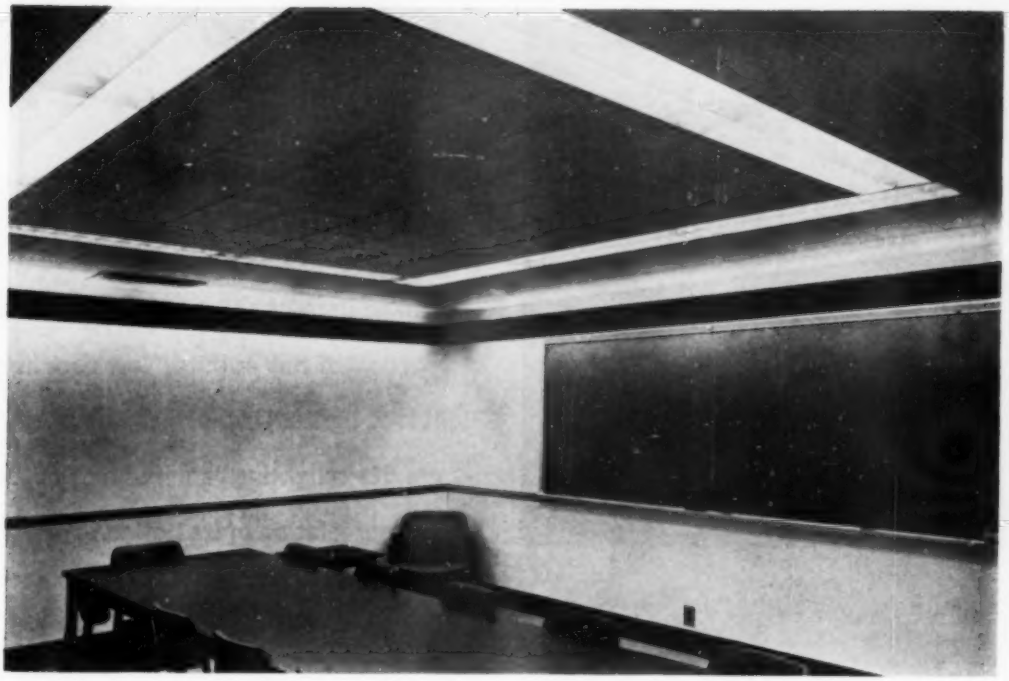


Figure 4 (above). One of a number of multi-purpose rooms such as this, lighted to serve as classroom, general student lounge, or around-the-table seminar room.

Figure 5 (below, left). Although the ceiling in this office is unfinished, a "luminous ceiling" effect is achieved with carefully controlled brightness between painted ceiling and ducts, and suspended luminaire.

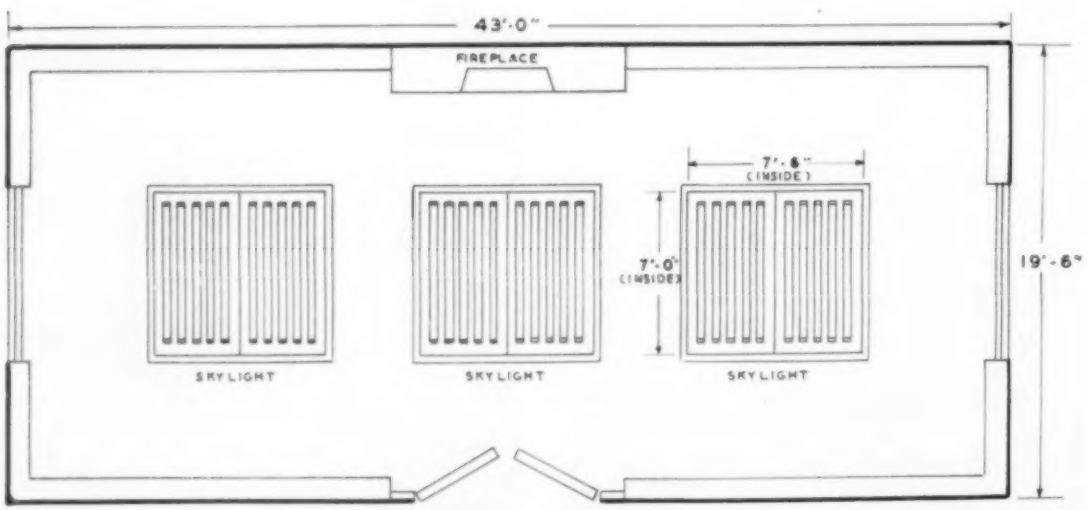
Figure 6 (below, right). Acoustical baffles used with this luminous ceiling in an executive office solve the acoustical problem created by the low (eight foot) ceiling.

Stately, warm, nostalgic– this is the atmosphere of the lovely old reading room of this Auburn, New York library. Built (and lighted) in a pre-engineering era, its relighting required a sensitive appreciation of its patina.

SEYMOUR Library Reading Room in Auburn, N. Y., is in a building of impressive architecture, situated on spacious walled grounds. Its turn-of-the-century warmth is exemplified by high paned windows at either end, an immense fireplace, seasoned wood, and an ornate plaster ceiling—17 feet high. Typical of its day, lighting was chiefly from three large skylights.

Relighting such a room requires a subtle plan. It also needs patience with problems, of which this room had its share. For one thing, its very size—43 feet by 20 feet with a 17-foot ceiling—demanded an efficient light source to provide a sufficient quantity of illumination to meet IES recommended practice. This would require 70 footcandles for study and notetaking, and 30 for reading. There were physical problems also, in the mounting of fixtures.

Lighting designer was Fitch S. Bills, New York State Electric & Gas Corp., Auburn, N. Y. The installation won third prize, Applied Lighting Competition, Central New York Section.



Plan of fixtures—two lamp F72T12 strip. There are ten fixtures in each bay—five mounted on each half of hinged plywood cover at top of skylight plenum. The louvered luminous ceiling element is suspended at lower edge of plenum and mounted flush with sides. Scale ¼" = 1'.

OLD [redacted] LIBRARY

The ornate plaster work of the ceiling was quite thick, and somewhat deteriorated in spots, giving rise to fears for ceiling damage.

Very limited maintenance service was also a factor. A new lighting system, it was felt, should provide improved accessibility. The old globe-type incandescent units were suspended less than two feet from the high ceilings, and required a tall ladder for servicing. Because of the inconvenience, they seldom received attention.

View of the completed installation in use.

The most practical solution seemed to be this: Above the room is a large attic, served by a stairway, which houses many old and rare volumes. The roof is actually one large skylight designed originally to allow light to enter the attic, and pass, in turn, into the Reading Room through its three seven-foot square skylights, located in the attic floor. First, the wood and glass frames of these skylights, located at the top of the plenum, were removed. Next, a louver-type luminous ceiling element was suspended flush with the lower edge of the plenum. A two-piece plywood cover was hinge-mounted at the top of each plenum, in place of the old skylight frames. Each section of this cover was provided with a rope and pully to facilitate opening. Finally, 10 two-lamp six-foot slimline strips were mounted on these covers, providing 20 lamps in each plenum, 60 in all (F72T12 cool white). Redecorating, for surfaces of acceptable standards, is underway but is not shown in these pictures.

The installation provides an in-service level of approximately 75 footcandles in the center of the room, 70 in the center near each end, 60 at the center of the side walls, and 40 in the corners. Thus, the recommended level for study and notetaking is provided in the areas where tables are located for this purpose, and the recommended level for ordinary reading is exceeded in all areas. The job is a neat example of a modern lighting system which is still compatible with architectural requirements.

Maintenance, of course, is quite easy. Service, when needed, is from the attic, without the use of ladders or other hazardous equipment.

Combating Juvenile Delinquency with Light

By ALEXANDER LURKIS

CRIME IN ANY form is abhorrent to our society. The natural reaction to murder, especially when it is committed by a teenager, is one of horror. In September 1959, the headlines in the New York City press featured the story of two young hoodlums who, the night before, had stabbed to death a teenager who was sitting on a bench in a playground which extends from 45th to 46th Streets between Ninth and Tenth Avenue, in the area known as "Hell's Kitchen."

The next morning, Mayor Wagner called a conference to determine how such acts could be prevented and what steps could be taken to reduce the juvenile delinquency that was accelerating in many parts of the city. At the conference it was reported that this playground had no lighting except for little or no spillover from the street lighting on 45th to 46th Streets. It was agreed that park playgrounds which are not lighted become havens for the area' delinquents because the police cannot readily see what is happening in them. Therefore, it was concluded that it is poor economy to spend large sums of money to construct playgrounds that cannot be used without danger, because they have little or no light.

The Department of Water Supply, Gas and Electricity, which is responsible, through the Bureau of Gas and Electricity, for the construction and maintenance of street lighting on all streets, highways and parks within the city, undertook the responsibility for the development of a program for lighting all playgrounds in areas where juvenile delinquency problems existed.

Physical Characteristics of Playgrounds, General Lighting Considerations

All public playgrounds in New York City, except those enclosed within school property, are operated by the Park Department. The Park Department furnished a list of 392 playgrounds, with an established order of priority for problem areas requiring lighting. A survey of typical playgrounds indicated that they could be divided into four functional types which, for lighting purposes, could be classified in three categories:

(1) 279 standard park playgrounds, similar to that shown in Fig. 1, varying in size and located on detached parcels of land. Twenty per cent contained few if any trees; 80 per cent contained trees on the perimeter as well as in the interior.

(2) 50 playgrounds adjacent to schools. These are normally small and contain no trees, similar to that shown in Fig. 2.

(3) 45 playgrounds adjacent to housing projects, similar to that shown in Fig. 3.

(4) 18 marginal playgrounds, located well within large park areas, similar to that shown in Fig. 4.

These areas were to be illuminated as follows:

(1) Unlighted playgrounds which did not contain trees could be illuminated from the exterior

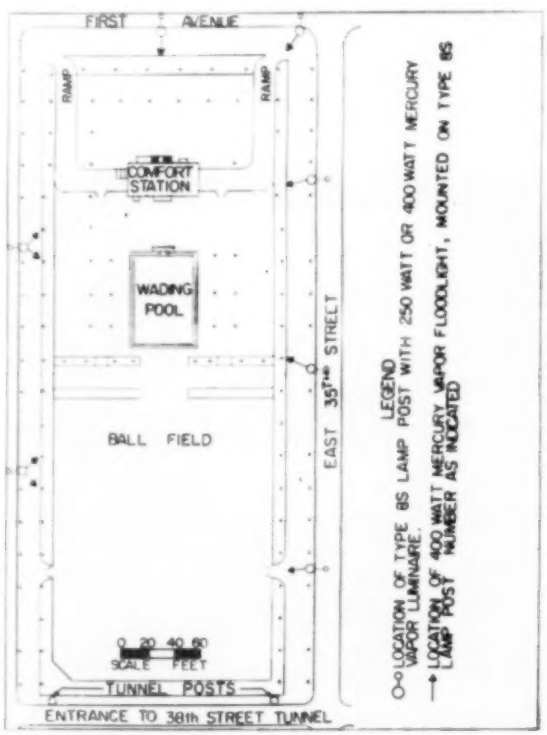

FIRST AVENUE
RAMP
RAMP
COMFORT STATION
WADING POOL
BALL FIELD
EAST 35TH STREET
0 20 40 60
SCALE FEET
TUNNEL POSTS
ENTRANCE TO 38th STREET TUNNEL
LEGEND
LOCATION OF TYPE 8S LAMP POST WITH 250 WATT OR 400 WATT MERCURY VAPOR LUMINAIRE.
LOCATION OF 400 WATT MERCURY VAPOR FLOODLIGHT, MOUNTED ON TYPE 8S LAMP POST NUMBER AS INDICATED

Figure 1. Typical standard playground.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 24-29, 1961, St. Louis, Mo. AUTHOR: Acting Commissioner, Department of Water Supply, Gas and Electricity, New York, N. Y.

Figure 2. Typical playground adjacent to public school.

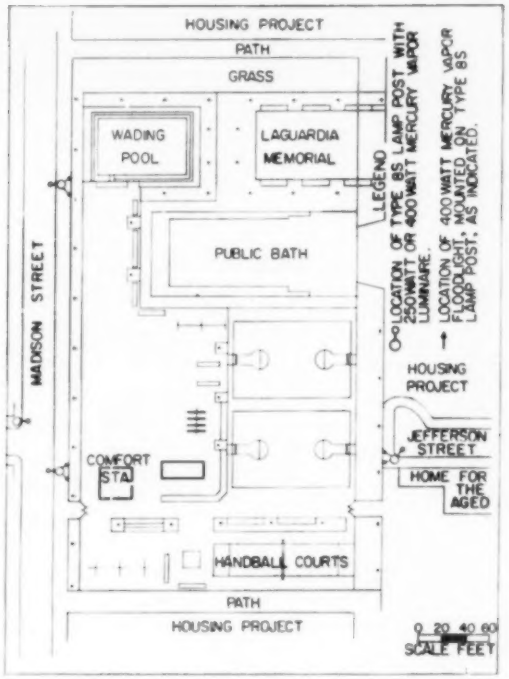


Figure 3. Typical playground adjacent to housing project.

(2) Unlighted playgrounds which contained trees would require both exterior and interior lighting.

(3) Playgrounds which contained trees and had some interior lighting were generally found to have insufficient, obsolete and corroded lighting systems and obsolete feeder systems. These areas required exterior lighting and completely new interior lighting systems.

To understand the differences between exterior and interior lighting systems, the power distribution method in New York City must first be understood. On city streets, the electric utility companies are obligated to furnish 120/208-volt power directly to lighting posts for exterior lighting. However, the utility's responsibility ends at the property line and, therefore, interior lighting requires an interior distribution and control system.

Before proper technical decisions could be reached certain agreements had to be made with the Park Department. All playgrounds were assumed to be open at all times, even though wire fences or iron gates enclosed the area. Experience had proved that juvenile delinquents would either cut the wire fences, climb iron gates or dig under fences. Therefore, playgrounds were accessible at all times. Playgrounds were to be illuminated during the entire lighting cycle by automatic control as a departure from the past practice of manual control during hours of specified use. Lighting was not to be designed for specific games, but for security, to provide a good silhouette so that car patrol and foot policemen could observe any delinquency.

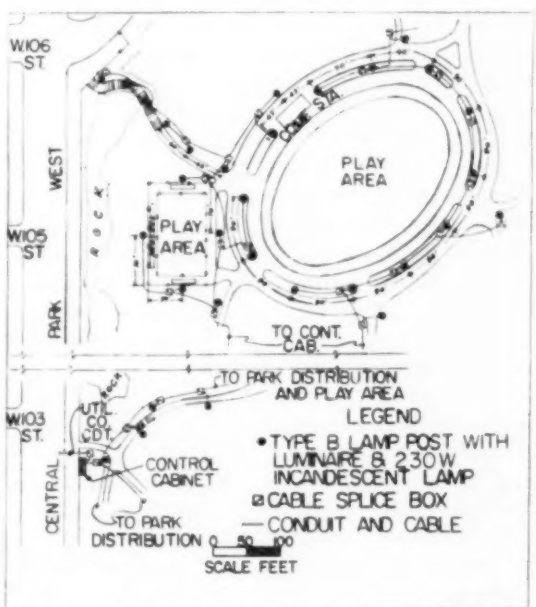


Figure 4. Typical marginal playground located within a large park area.

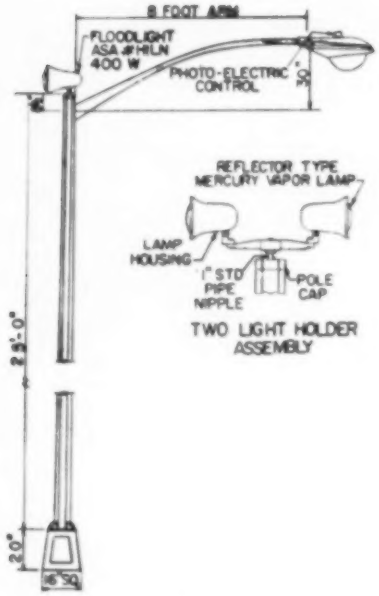


Figure 5. Type 8S steel lamp post with one or two floodlights.

With these basic principles, it was determined that exterior lighting could be provided by floodlights placed on 26-foot, 8-inch high poles, properly located on the exterior streets. Interior lighting located at roads and serviceable from maintenance trucks could also be furnished from high lighting standards. Where trees blocked the height and poles could not be reached by trucks but maintained only from ladders, the low park-type poles, approximately nine feet high, classified as Type B, would be required.

Exterior Lighting

For exterior lighting, it was determined that the best location of the floodlights would be at the top of the poles, thus placing the center of light at 27 feet 6 inches above the ground, as shown in Fig. 5. Where double floodlights were required, the mounting system shown in Fig. 5 was developed. Control was to be individual, by plug-in type photoelectric cells, mounted as shown in Fig. 5.

Selection of the lighting equipment for the exterior floodlighting was based upon the following factors:

(1) Since the floods were to burn approximately 4100 hours per year, a maximum light output lamp with minimum power consumption, long life and low maintenance was required. The answer was the mercury lamp.

(2) A fairly narrow beam was required for penetration of the tree foliage surrounding 80 per cent of the playgrounds, and to permit close control of the light to prevent disturbing glare in the dwellings generally located opposite the floodlights. Lamps had to be light, easily installed, low in initial cost and readily maintained.

A 400-watt coated mercury lamp with 60-degree beam spread and a 40,000 maximum candlepower was selected. Average lamp life is 12,000 hours. The lamp furnishes 18,500 initial lumens, and at 50 degrees from beam axis provides sufficient candlepower to illuminate the areas close to the playground perimeter. Constant wattage ballasts, located in the lamp post base, are used.

The lamp selected had a somewhat narrower beam than was desired, but results are fairly satisfactory. It is installed within a hood, as shown in Fig. 5, for protection against vandalism.

Wherever a floodlight was installed a 250- or 400-watt integral ballast mercury street lighting luminaire was also installed to increase street illumination in the area, with one light standard used for the two jobs. One control is used for the floodlight and street luminaire. Typical locations are shown in Figs. 1-4. Total cost was estimated at $480 per unit.

Interior Lighting

Since the interior lighting had to be low mounted, as previously concluded, mercury could not be used. Therefore, the standard 230-watt incandescent park units, without refractors, spaced 90 feet apart, were chosen (see Fig. 6*). This provided a low first cost, easily-maintained unit which was also rugged, to

*See rebuttal in later issue.

Figure 6. Type B lighting standard for park area.

minimize the effects of vandalism. It was estimated that together with the distribution system each unit would average $1300. Controls for the lighting and the typical plan are indicated in Fig. 4. Total estimated cost of installation, including design and supervision of construction for the 392 playgrounds, was $4,058,900. Additional maintenance and power cost was estimated at a cost of $252,066 annually.

Actual Installation

Two possible procedures were available for the completion of these projects. Procedure No. 1 involved the completition of all exterior lighting first. This was estimated to take a year's time and cost $1,187,200. Interior lighting would follow during the next three years at an annual expenditure of $957,250. Procedure No. 2 called for the 18 marginal playgrounds and the 124 playgrounds requiring exterior lighting only to be lighted during the first year at a cost of $546,500, and the remaining 268 playgrounds, requiring both interior and exterior lighting, to be completed one at a time during the next three years at a cost of $1,170,800 per year. Procedure No. 1 was recommended, since it would result in some illumination in every playground. This plan was adopted by the New York City Board of Estimate.

To execute this program, the force had to be enlarged by 11 engineers and inspectors. Surveys were made and plans designed. High priority was given to the construction contractor to install the lighting as soon as designs were completed. Actual cost per exterior unit with one mercury luminaire and one floodlight is $417. Where two floodlights are used, the cost is $533. Average cost for the standard and marginal playgrounds, in addition to the street luminaire, is $3800 per playground for exterior lighting, where required, and $9200 for the interior lighting, including the distribution system. Average cost for the other playgrounds is $3000 for the exterior and street luminaires and $6000 where interior lighting was required.

Lighting Results

A lighting survey of the playground shown in Fig. 3, in which the children's play area is illuminated by a two-floodlight unit, indicates that one floodlight (vertical fc are calculated) provides:

At 50 feet from the base of the floodlight pole, at beam axis of floodlight, illumination was 2.10 horizontal footcandles and 3.90 vertical footcandles. The average footcandles for a 100-degree spread are 0.95 horizontal footcandles and 1.82 vertical footcandles.

At 100 feet from the base of the floodlight pole, illumination at beam axis of floodlight is 0.5 horizontal footcandles, 1.85 vertical footcandles. Average footcandles for 60-degree beam spread are 0.3 horizontal and 1.18 vertical.

One floodlight illuminates the basketball area.

At 60 feet from the base of the floodlight pole, illumination at beam axis of floodlight is 0.88 horizontal footcandles, 1.95 vertical footcandles. Average footcandles for 100-degree spread are 0.40 horizontal and 0.97 vertical.

At 100 feet from base of floodlight pole, illumination at beam axis of floodlight is 0.22 horizontal footcandle, 0.815 vertical footcandle. Average footcandles for 60-degree spread are 0.18 horizontal and 0.40 vertical. In the center of the playground average horizontal footcandle readings are 0.12; vertical, 0.52.

At the marginal playground in Tompkins Square Park, similar to Fig. 4, illumination of the northwest playground is by two floodlights. Illumination provided by one of the units is:

At 50 feet from base of floodlight pole, illumination at beam axis of floodlight is 0.72 horizontal footcandle, 1.33 vertical footcandles. Average reading for 100-degree spread is 0.3 horizontal footcandle, 0.61 vertical footcandle. At 100 feet from base of floodlight puole, illumination at beam axis of floodlight is 0.13 horizontal footcandle, 0.58 vertical footcandle. Average readings for 60-degree spread are 0.085 horizontal footcandle and 0.37 vertical footcandle.

The northeast playground is lighted by three floodlights, providing an average illumination level of .075 horizontal footcandle in the center of the playground. Between two Type B lamp posts spaced 110 feet apart, the average horizontal reading is 0.11 footcandle.

The ballfield at St. Gabriel Park, similar to the area shown in Fig. 1, is illuminated by two floodlights at opposite ends of the park. Illumination from one of the floodlights is:

At 50 feet from base of floodlight pole, illumination at beam axis of floodlight is 0.99 horizontal footcandle and 1.83 vertical footcandles. Average footcandles for 100-degree spread are 0.62 horizontal and 1.27 vertical. At 100 feet from base of floodlight pole, illumination at beam axis of floodlight is 0.18 horizontal footcandle, 0.665 vertical footcandle. Average footcandles for 60-degree spread are 0.11 horizontal and 0.23 vertical. Along a sitting area in front of a wading pool on the 36th Street side, a heavy tree area, measurement indicated the average horizontal illumination to be 0.18 footcandle.

Conclusion

Results in the first stage of the lighting program have been astounding. The Police Department has endorsed the program with great enthusiasm; the

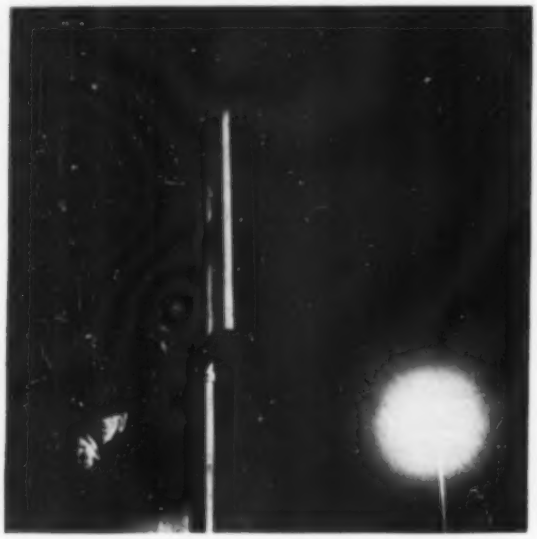


Figure 7. Scenes in some relighted playgrounds. Since the lighting has been installed, New York has reported a drastic reduction in vandalism, decreased littering, fewer instances of disciplinary problems and fewer break-ins. Photographs by Lew Merrim, *The New York Times*.

Park Department has pointed to a drastic reduction in vandalism in the relighted playgrounds. Vandalism in Staten Island's relighted play areas has been virtually wiped out; in Brooklyn it is down 86 per cent; in Manhattan, down 81 per cent; and in the Bronx and Queens, down 50 per cent. The floodlighting has also diminished indiscriminate littering of playground areas with broken bottles, beer cans and other materials. Fewer instances of disciplinary problems and better control of the teenagers have been reported. Fewer break-ins have occurred as a result of the improved lighting facilities.

The New York Times in its magazine issue of November 8, 1959, told the story in the pictures shown in Fig. 7. In some cases where glare problems have arisen, reflector shields were designed and installed.

It has been found that the exterior lighting has been so successful that upon re-evaluating the program it was decided to extend the program to spend $1,000,000 next year to provide exterior lighting for school playgrounds and to install the interior system only in marginal playgrounds and those playgrounds having considerable depth.

Some engineers in evaluating the cost of safety have tried to evaluate the price of a life saved. We consider every life priceless and the investment made in behalf of the security of every individual is considered well-spent money.

Ballast Thermal Protection

By D. LOVINGER

In order to protect the ultimate light user from the undesirable conditions that can occasionally occur as a result of ballast failure, more than one degree of protection must be employed. This paper analyzes the mechanisms of ballast failure and the various means used to provide the most effective protection.

SOME DAY every fluorescent lamp ballast must fail. When this happens, the possibility exists that this failure could be accompanied by conditions which could cause personal and property damage. Although the risk is quite small, this risk is a fact of life that the fluorescent lighting industry must face.

Need for Ballast Protection

What is a ballast and how can it cause these conditions? Ballasts are simply electromagnetic devices, class A insulated, that make the starting and operating of fluorescent lamps possible. In the course of normal operation, ballasts experience the same insulation degradation as that of other class A electrical equipment. (The average design life of a fluorescent lamp ballast is about 12 to 15 years under normal operating conditions.) A ballast contains core and coils made of steel, copper wire, organic wire insulation, paper insulation, and various filling materials, both synthetic and organic. In addition, there are components such as radio-interference suppression capacitors, liquid-impregnated paper-aluminum power-factor-correcting capacitors, rubber and synthetic-rubber insulated lead cable.

All these materials are considered class A; *i.e.*, they can operate under normal conditions at temperatures up to 105°C (up to 70°C for power-factor-correcting capacitors) without severe loss of life. Ballasts, therefore, are designed to operate in fluorescent luminaires where these components and insulation systems will not experience more than 105°C. However, even at 105°C, normal degradation will occur during the life of the ballast. When this insulation has "worn out" after many years of service, dielectric breakdown occurs, resulting in component failure.

A ballast can fail in many ways. Perhaps the simplest classification is three degrees of failure. First, and least likely to occur, is the occasional failure of the ballast that can result in smoking and even luminaire eruption. A second, and far more subtle type, is failure of a component or part of the insulation that will result in some form of external leakage or other visible evidence that the ballast has failed. The third, and most prevalent, is that kind of failure which results in the inability of the ballast to start and operate the lamps.

In the case of luminaire eruptions, ballasts are, generally speaking, quite old and have seen many, many years of faithful service. When the final failure occurs, it is usually the climax of a series of lesser failures within the ballast insulation system. During the final degradation of the insulation system, gases are generated which, coupled with ideal atmospheric conditions, can be ignited upon being recycled or re-energized. In order for luminaire eruptions to occur, the circumstances must almost be "ideal;" that is, the degree of enclosure, the composition of the gas mixture, the kind of failure, and the exact time at which the failure occurs, must all be optimum in order to cause an actual eruption of the luminaire. Past experience would indicate there is less than one chance in a million that a luminaire eruption can actually occur.

Mechanisms of Ballast Failure

A common mechanism of ballast failure today seems to be those failure conditions that occur when one of several ballast components fails and, as a result, produces excessive heating. This excessive temperature can result in further degradation of the insulation system if the ballast continues to operate. Commonly, this component failure will result in ballast overheating which, in turn, can cause extrusion or leakage of ballast filling materials.

Ballasts can and do fail in most cases where there is no more outward evidence of failure than the lamps extinguishing. In these cases, a component has usually failed "open," de-energizing the ballast with no excessive current or heating or possibility of leakage. This is by far the most common type of failure.

So far, the discussion has centered around the

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 24-29, 1961, St. Louis, Mo. AUTHOR: General Electric Co., Ballast Department, Danville, Ill.

kinds of things that can happen when ballasts fail. Certainly the various industry standards bodies have done an outstanding job of protecting against many of these possibilities. For a better analysis of how to protect against the undesirable conditions that can result from one of the several kinds of failures, it is best to discuss the external manifestations of fault and how they can be sensed. Ballast failures that can cause undesirable conditions fall roughly into three categories: first, those failures of insulation materials or components that result in excessive input current and, in most cases, excessive heating; second, those ballast failures that result in excessive heating which can, in turn, result in leakage without a large increase in input current to the ballast; and third, the failure of the ballast insulation system or components that can result in leakage, but without either increases in line current or excessive heating.

Current Sensitive Protectors

To protect against the first type of failures—those failures of components or insulation system that reflect themselves as substantial increases in ballast current—the National Electrical Code clearly spells out the need for branch circuit protection. This protection usually takes the form of circuit breakers designed to sense the extreme overloads that can result when one ballast on a branch fails. This type of protection will, for example, detect shorted primary windings that reflect excessive current to the input of the ballast.

Properly applied and rated branch circuit protectors should actuate as a result of this kind of fault, usually removing an entire bank of lighting equipment from the line. Unfortunately, it often takes a complete investigation of all the luminaires in the branch circuit in order to locate the faulty ballast. In addition, when the circuit breaker is reclosed, there is the possibility that the restarting of the faulty ballast may result in further aggravation of the fault.

Unfortunately, some faults that result in excessive input currents to the ballast do not produce enough increase in current to actuate a circuit breaker. For such, a more positive means of removing the ballast, the individual luminaire fuse, has been used in the lighting industry for many years. The advantage of individual fusing is that the individual ballast or luminaire can be fused much more closely than a branch circuit consisting of a number of good ballasts and perhaps a single faulty ballast.

In years past, the single-element, "quick-blow" fuse has been used by many luminaire manufacturers, particularly in the case of enclosed, recessed units. Records to date indicate no violent failure when a luminaire has been properly fused. Unfortunately, because of their sensitivity to line voltage and current surges, quick-blow fuses must be selected in ratings several times greater than the desired fuse rating. This is done to make sure that the fuse will not remove the ballast from the line when a transient condition exists, but will still offer a substantial degree of protection when a fault resulting in excessive ballast input current occurs.

More recently, the use of the "slow-blow" or dual-element fuse has become commonplace. The advantage of a slow-blow fuse is elimination of sensitivity to transient conditions, thereby allowing the luminaire manufacturer to fuse much closer to normal operating conditions and, as such, to be better able to sense any faults that result in rises in input currents. Individual ballast fusing also has the advantage of avoiding the nuisance branch circuit outage that can occur when one ballast on a branch circuit fails.

Thermally Sensitive Protectors

The main limitation to both fuses and branch-circuit protectors, particularly in modern-day, lead-circuit type ballasts, is that all faults do not manifest themselves in a substantial increase in input current to the ballast. The second type of failure, then, is that which can result in extreme overheating without reflecting a large increase in current to the input of the ballast. In such cases, there is a

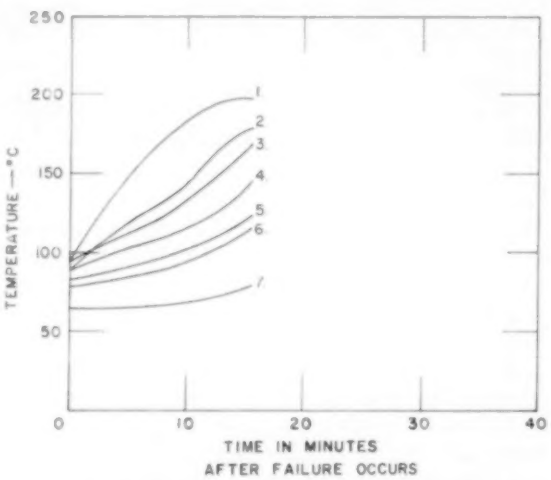


Figure 1. Temperatures in various locations in a two-lamp 96T12 series-sequence instant-start ballast after a one-layer short is produced in the operating secondary. (1) Operating secondary; (2) On case over operating secondary; (3) Primary; (4) On case over primary; (5) In starting winding; (6) On case over starting winding; (7) Capacitor.

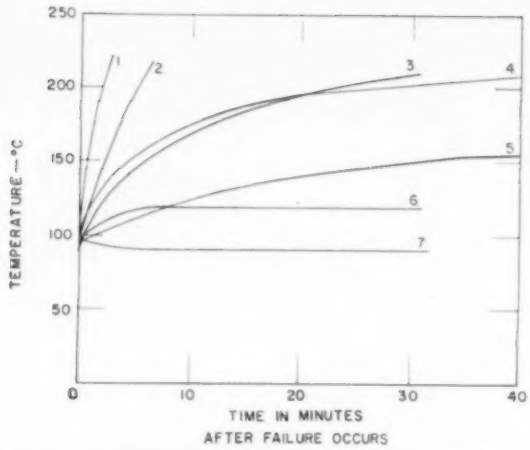


Figure 2. Temperatures of a particular location in a two-lamp 40-watt rapid-start ballast under various conditions of failure. (1) One layer short in primary; (2) Shorted power and starting capacitor; (3) Shorted power capacitor; (4) One layer short in secondary; (5) Shorted cathode winding; (6) Shorted R.I. capacitor; (7) Shorted starting capacitor.

need to sense something other than current in order to protect the ultimate light user properly from the damage that can occur with the failure of a ballast. Since in all such cases extreme temperature increases are experienced, it would appear that temperature sensing is the common denominator to failures of this type.

There are several kinds of ballast thermal protectors on the market at present, but, in general, their purpose and function are virtually the same. These thermal protectors are strategically placed in the ballast, near the core and coil, to sense any excessive temperature that can result in undesirable conditions.

Fig. 1 describes the kinds of temperatures that a typical two-lamp, 96T12 series-sequence instant-start ballast can experience in the process of failing. These curves denote temperatures in the various parts of the ballast and demonstrate the need for proper location of the thermal protector if adequate protection is to be maintained.

Fig. 2 describes the time-temperature relationship of a particular location in a two-lamp, 40-watt, rapid-start ballast under various conditions of failure. As indicated by the curves, some temperature rises are quite sharp, while others are slow. However, the ballast manufacturer's proper selection of temperature sensitivity of the protector should prevent any resultant damage.

Fig. 3 cites a particular example of the second type of failure where overheating is present, but without a large rise in input current. These curves describe the kinds of temperatures that result from failure, yet would not be protectable by means of either branch circuit protectors or individual ballast fusing.

Capacitor Rupture Protection

The third type of ballast failure that can produce undesirable results is that condition where leakage can occur, yet neither excessive heat nor current is produced initially. The most common example is the failure of the ballast power-factor-correcting capacitor in certain series-lead circuit ballasts. In this circuit, both lamp operation and power-factor correction are provided by the metal-encased, liquid-impregnated, paper-aluminum capacitor.

These capacitors generally fail either open or short. When they fail open, the result is usually the extinction of the lamps and a loss of power to the capacitor. Generally speaking, this will not result in extreme overheating, and in fact, is the kind of failure that usually does not manifest itself in undesirable conditions. The more common mechanism of failure for a ballast power capacitor is to fail short. In this respect, it is not very much different from the insulation system in the ballast core and coil. The ballast power capacitor is a class A insulated device that, over a long period of time, will gradually degrade and either fail short by a dielectric puncture through weakened insulation, or by "thermal runaway."

Thermal runaway is a description of the failure process of a capacitor that has been in operation for some time and has experienced some loss of

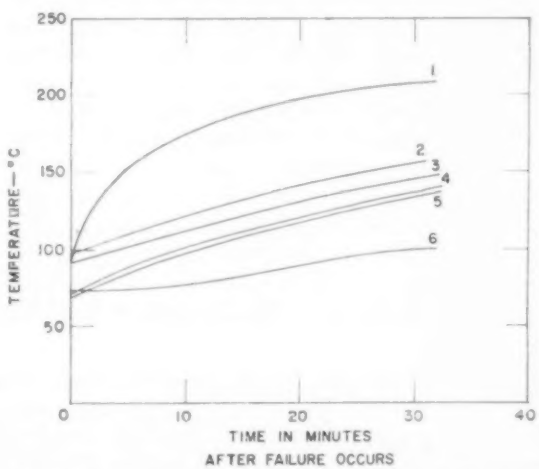


Figure 3. Temperature in various locations of a two-lamp 40-watt rapid-start ballast after the power capacitor has shorted. Line current before fault .82 amperes; line current after fault 1.15 amperes. (1) Primary; (2) Secondary; (3) Between primary and secondary; (4) Alongside primary winding; (5) Alongside secondary winding; (6) Capacitor.

insulation life. With this degradation, the power factor or dissipation factor of the capacitor has risen sharply. Thermal runaway occurs when the capacitor enclosure is not able to dissipate the internal loss of the capacitor. In this particular case, internal temperature of the capacitor can rise to as high as 300 to 400°C. When this occurs, the excessive temperature causes further rapid degradation and gassing of the insulation system of the capacitor. This gassing results in an extreme pressure build-up in the capacitor container, and in some cases, can result in rupture of the container.

When this type of capacitor failure occurs, some degree of overheating or overcurrent is usually reflected to the ballast core and coil. However, as shown in Fig. 4, sometimes neither excessive current nor heating manifests itself in the ballast core and coil, making it impossible for either ballast thermal protectors or individual fuses to prevent the damage that can result from the rupture of the ballast capacitor container. Therefore, it is apparent that the capacitor needs some protection to prevent leakage. This protection can be provided by some means of thermally sensitive fuses. There are capacitors available today that now perform the normal function of a ballast capacitor and also offer protection against rupture.

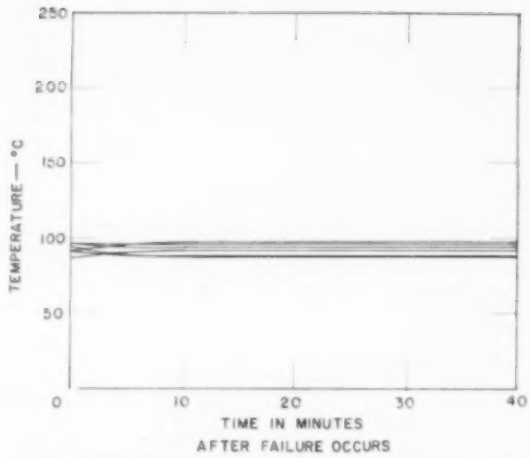


Figure 4. Temperature rise in various locations of a two-lamp 96T12/HO ballast after power capacitor has shorted. In this case, temperature rise is slight and would not actuate typical thermal protector.

Requirements for Complete Ballast Protection

In summary, it is apparent that to protect the ultimate light user from the undesirable conditions that can occur as a result of ballast failure, more than one degree of protection must be employed. With today's ballasts, it would seem necessary that protection must take the form of: (1) excessive current sensitivity in the form of either branch circuit protectors or individual ballast fuses; (2) ballast thermal protectors that can sense ballast core and coil overheating; and (3) temperature-sensitive devices in ballast capacitors that can prevent the rupture of these capacitor containers.

Since the fluorescent lighting industry is still comparatively young and has a great future ahead of it, serious consideration must be given to all the protective features mentioned to ensure that the fluorescent lighting industry is not given a "black eye" by one or two unfortunate incidents. Certainly the economics of the protection system must be taken into consideration, since the light user will, in the end, pay for the protection afforded. Therefore, it would seem that the lighting industry needs the most inclusive and economic protective system that it is possible to obtain. Only in this way can the industry assure itself of continued new business and progress in the field of fluorescent lighting.

January 31—Deadline for 1962 Conference Paper Outlines

The IES Papers Committee has designated January 31, 1962 as the deadline for submittal of outlines for proposed papers for the 1962 IES National Technical Conference in Dallas. Outlines should be sent to:

Benjamin S. Benson, Jr.
Chairman, IES Papers Committee
Benjamin Division, Thomas Industries, Inc.
Des Plaines, Ill.

INSTALLATION AT DAWSON TAYLOR CHEVROLET INC.,
9711 GRAND RIVER, DETROIT, MICH.

Floodlighting a Building

LIGHTING OBJECTIVE: To floodlight a building's facade to facilitate its identification and to attract passing motorists.

GENERAL INFORMATION: The building's frontage on Grand River as shown above is approximately 165 feet in length. The limestone exterior (50 per cent reflectance), shown on the left, is 20 feet high. The painted sign exterior (dark red background, 20 per cent reflectance), shown on the right, is 16 feet high.

INSTALLATION: Floodlighting is provided by Wide-Lite catalog No. JR-250-AWB mercury luminaires each equipped with one H5KF 250-watt improved color mercury lamp. These units have a cast aluminum body, a specular Alzak aluminum reflector and a Neoprene gasketed tempered glass cover. They are mounted at roof height 7 feet out from the building on 15-foot centers (7 feet 6 inches from the ends), and are aimed downward and inward toward the building.

The resulting average vertical illumination measured 50 footcandles at the top of the building, 30 footcandles 10 feet down and 10 footcandles near the sidewalk.

Lighting designed by James F. Finn, The Detroit Edison Co., Detroit, Mich.

Lighting data submitted by Walter Reeves, The Detroit Edison Co., Detroit, Mich. as an illustration of good lighting practice and to aid in the design of similar installations.

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Series XXVI
10-61

A.I.A. File No. 31 f

Design and Application of

Panel Type Fluorescent Lamps

By C. M. CUTLER
W. C. MARTYNY

A compact fluorescent lamp in the form of a panel to fit a 12- by 12-inch module adds a new dimension to the design of lighting systems and luminaires. It provides an opportunity for further advancement of the techniques and art of illumination. This paper describes a panel fluorescent lamp and its characteristics, including candlepower and brightness distributions. Some considerations for application, and concepts of luminaire design are discussed, as well as a method of louvering for brightness control and data on performance of some luminaire mock-ups.

SINCE THE introduction of fluorescent lamps over twenty years ago, there have been tremendous strides in the development of this light source, the accessories used with it and the luminaires designed for it. In the past few years, new fluorescent lamp types with increased light output per foot and performance comparable to previous fluorescent designs have been introduced. These developments have gone a long way in improving the levels of general lighting and the techniques of application. Along with the developments in the light source, great advances have been made by luminaire designers. Their ingenuity has resulted in more designs which are shallower and less obtrusive, and at the same time provide improved brightness control.

Tubular sources offer many opportunities to the luminaire designer, whose present-day concepts have been developed around that basic form. To expand further the field within which the designer can apply his skill, there has been a constant search for new forms to develop fresh-looking luminaires and systems. A compact source of entirely different proportions becomes a new basic form creating further design opportunities.

New Form

A fluorescent panel lamp is a compact source meeting this need, making more light practicable in a relatively small space. At the same time, it has the high efficiency and long life which characterize tubular fluorescent lamps of 48 inches or longer. A 12-inch square source makes luminaire dimensions in the 12- to 48-inch range more feasible, without sacrificing the desirable features of the longer tubular fluorescent lamps. The 12-inch square also gives greater flexibility in fitting the lamp to the variety of today's building modules.

A fluorescent lamp that is a square panel extends the refinements that may be made in the design of luminaires and lighting systems. One of these is the simplicity of corner designs that continue the architectural objectives of other parts of the pattern. The style of ceiling luminaires or systems may be preserved, and by choosing lamps of different distributions more light may be provided over specific areas. Opportunities are increased for the introduction of accents in patterns that are otherwise uniform. Light emission from two surfaces of the square creates further design flexibility in luminaires. For example, color may easily be introduced in a unit whose source otherwise provides essentially white light. The form of the face lends itself to efficient designs of louvers for brightness control in luminaires.

Lamp Design and Development

The concept of such a light source is by no means new. Panel-type compact fluorescent light sources were worked on as early as 1946. However, glass techniques had not advanced to the point they have today, and the result then was a heavy glass construction not compatible with the manufacturing techniques of that time.

Careful studies of probable applications indicated that a very useful solution would be a panel which, with its framing members, would fit into a 12-inch module. At the same time, it seemed desirable to develop a compact source as a lamp of higher loading, in keeping with the trend in that direction.

The over-all dimensions of the panel selected are

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 24-29, 1961, St. Louis, Mo. AUTHORS: General Electric Co., Nela Park, Cleveland, Ohio. Accepted by the Papers Committee as a Transaction of IES.

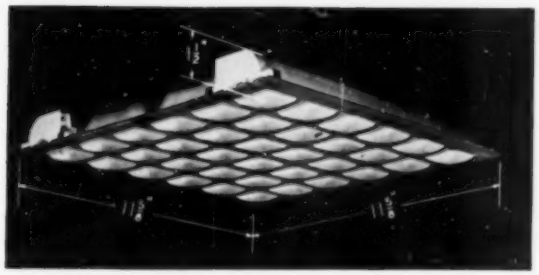

Figure 1. Panel fluorescent lamp. A connector has been designed which will fit between the two recessed bipin bases shown.

11⅝ by 11⅝ by 1½ inches (Fig. 1). This includes a $\frac{7}{16}$-inch rim which surrounds the luminous portion of the lamp and can be used for supporting it. The rim also serves as the location for the lamp bases. Experience indicated a 60-inch arc length could be designed into this panel size; the cross section for the arc would be approximately that of a 1¼-inch diameter tube. Information gained in manufacturing non-circular cross section lamps[1] was valuable in producing a design of adequate strength without excessive weight.

The fluorescent panel consists of two phosphor-coated plates sealed together. The configuration of the back plate follows the arc path; the face plate has raised forms which give a pleasing appearance both lighted and unlighted. These configurations tend to conceal the arc path when the lamp is lighted, giving a smoother appearance while providing textural pattern. The formed configurations provide two other advantages. First, the weight of the face plate may be reduced as compared to what would be required in a flat plate for the same strength; second, they tend to reduce the brightness when viewed at grazing angles, in comparison to the somewhat higher brightness and broader flux distribution that would result from a flat textured surface (Figs. 1 and 2).

In order to keep the panel as shallow as possible, techniques were developed to exhaust the lamp and bring out the cathode leads at the rim. This enables the lamp to be based at the rim, keeping the over-all height to a minimum. (Fig. 1)

Electrical connections may be made to the lamp by a bar-type connector designed to fit between the two lamp bases. Removal is accomplished by grasping the connector with two fingers and the thumb and then pushing in one indicated direction to release the connector from between the bases. The objective was to make it easy to disconnect the lamp when it is held in one hand or by a frame, and also to keep the connector within the over-all dimension of the lamp.

Performance Characteristics

With the improved phosphors available today and improvements in manufacturing techniques, a lamp of fairly high output has been produced. The lamp operating characteristics are shown in the following table.

Lamp watts	80	
Lamp volts	145	
Lamp amperes	.60	
Lumen output	4800	(cool white)
Lumens per watt	60	
Life	7500	hours (at 3 hours per start)

In a long life design, appearance, freedom from end discoloration and lumen maintenance are of primary importance. For this reason, argon filling gas at 2.8 mm pressure was chosen. In addition, the rapid-start low voltage cathode is used. Plate anodes of large area are also incorporated to decrease end losses and further reduce end discoloration in the cathode region.

Insufficient time has elapsed to establish a true maintenance curve. However, data available indicate it will be on the order of 85 per cent at 3000 hours and 77 per cent at 7500 hours.

Unlike previous rapid-start lamps, the panel will have its own starting aid, and will not be subject to the present specification of ½-inch width of metal within ½-inch of the lamp. This should give greater freedom in design of luminaires and a variety of units for other applications. The starting aid consists of a series of stripes imprinted on the back panel. These are contacted by a finger which may be part of the bar connector, which in turn is connected to the ballast. For indoor ballasts, the minimum rms voltage across the lamp for single-lamp starting appears to be 250 volts, and for two-lamp series starting, 370 volts.

Both reflectorized and unreflectorized lamps are needed for the variety of applications such a lamp is expected to have. The reflectorized lamp is being designed to give approximately 80 per cent of its total lumens from the face plate and 20 per cent from the back plate. Reflectorizing is accomplished by means of a durable high reflectance coating. Furthermore, the coating assures maintenance throughout life which will be the same as for the unreflectorized lamp. The color of light from the back plate will be compatible with that from the face plate.

Candlepower and Brightness

In unreflectorized designs, approximately 50 per cent of the light will be emitted from the face plate and 50 per cent from the back plate. (Fig. 2)

Straight tubular lamps have required, in general,

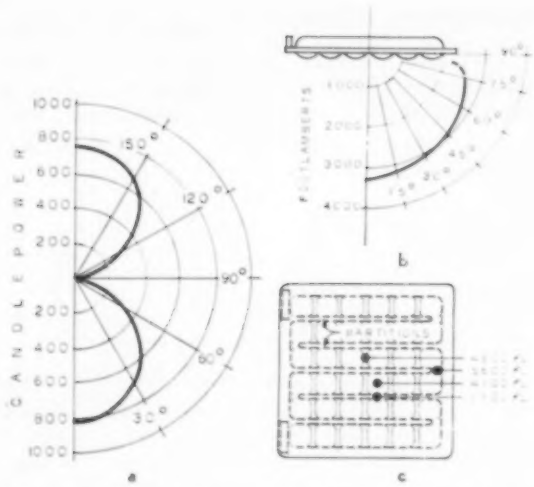

Figure 2. (a) Candlepower distribution of bare lamp; (b) average brightness distribution about face of lamp; (c) brightnesses measured at several significant points on face of lamp. Note that maximum point falls at U-turn of the arc path.

only one candlepower measurement perpendicular to the lamp prior to photometric testing in equipment. This is due to the uniform brightness and light distribution around the light sources. Ratio factors (lumens to candlepower perpendicular to the lamp) have long been established for each lamp length.

The fluorescent panel should be treated as a luminous plate. As the configurations on the face plate and the back plate are different, two candlepower readings must be obtained—one taken directly below and one directly above and perpendicular to the panel. From these two readings, ratio factors (lumens to candlepower) can be established.

The average brightness of the face plate of the unreflectorized lamp at 80 watts will be on the order of 3200 footlamberts and for the reflectorized lamp 5000 footlamberts. The brightness is lower at narrow angles from the plane of the face plate as compared with that normal to the face. (Fig. 2b) The criteria of brightness established for various applications will apply just as for other forms of lighting equipment, such as conventional fluorescent luminaires.

Some General Application Considerations

For interior use, the applications fall broadly into pendant and recessed lighting techniques and specialized uses such as for displays, show windows, signs, wall panels, decorative elements, etc. Control of light with conventional sizes of reflectors is obviously not possible, so applications requiring accurate redirection or concentration of light are not feasible. Where fluorescent lamps are designated for the latter purpose, those of tubular form are inherently better adapted.

It is expected that the fluorescent panel will be incorporated in all types of ceiling designs. Semi-direct, general diffuse and semi-indirect luminaires which are normally suspended will not ordinarily require special attention in the design to assure good lamp and ballast performance. Direct luminaires that are recessed or surface-mounted operate at higher temperatures. These types need careful design consideration in order to keep within ballast temperature limits and to assure maximum light output from the lamps. (Fig. 3)

The ballast should in all cases be mounted so that there is good contact between it and the metal of the luminaire or enclosure to provide for good conduction. In addition, it is desirable to position the ballast to minimize heating it by direct radiation or convection from the lamps. In some luminaires, such as 12-by-12-by-5½-inch recessed types, it may be necessary to operate the lamp at reduced wattage (50 watts), in order to avoid excessive ballast temperatures.

Luminaire Design Concepts

Among the attractive features of this compact fluorescent source is the concentration of light flux in a small area, and the fact that the bare lamp flux is emitted entirely in a "direct-indirect" distribution. (Figs. 4 & 5) It does, however, require careful control of downward brightness for many applications, just as with other fluorescent sources. The convex squares forming the face become, in a sense, individual light sources—the spaces between the grid pattern being the principal source of light. The wedge louver design with specular finish is an ideal type to use with this lamp when minimum brightness is required in the shielded zone.[2] The louver structure may be designed to fit the grid

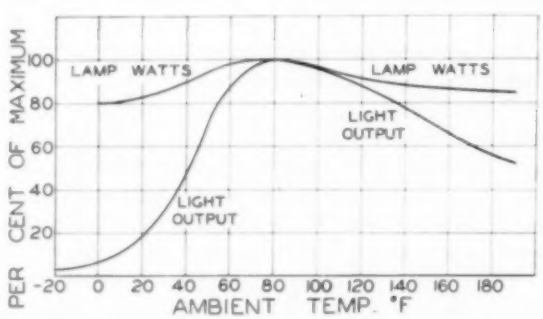

Figure 3. Preliminary data on lamp watts and light output, variation with ambient temperature.

Figure 4. Four demonstration luminaires suggesting some design and application possibilities.

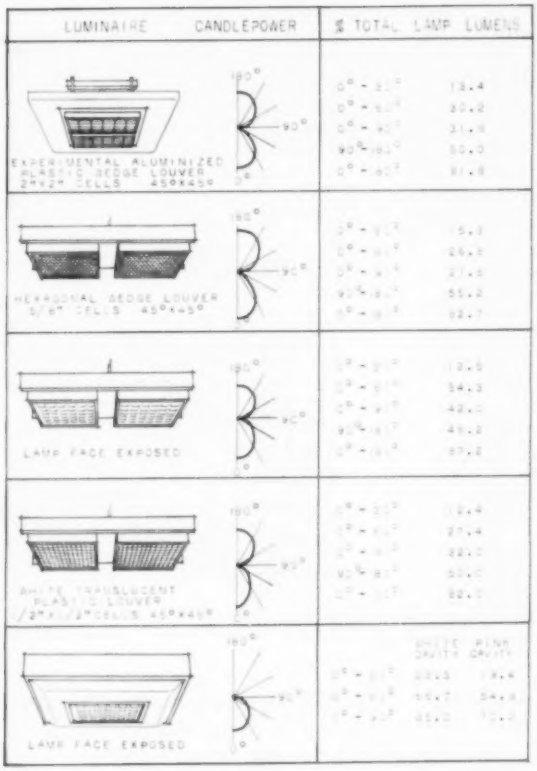
LUMINAIRE CANDLEPOWER
% TOTAL LAMP LUMENS
EXPERIMENTAL ALUMINIZED PLASTIC EDGE LOUVER 2"x2" CELLS 45°x45°
HEXAGONAL EDGE LOUVER 5/8" CELLS 45°x45°
LAMP FACE EXPOSED
WHITE TRANSLUCENT PLASTIC LOUVER 2"x1 1/2" CELLS 45°x45°
LAMP FACE EXPOSED

Figure 5. Performance data on several suggested luminaire types, some of which are illustrated in Fig. 4.

lines on the face. (Fig. 6) Since part of these lines are produced by the partitions between arc passages, they are of lower brightness as shown in Fig. 2e; and when they are covered by the louver bars less light is intercepted than would occur with a random positioning of louver cells of less compatible dimensions.

Light output measurements with a photometric integrator show that the positioning of louver blades makes a considerable difference in performance. The table below gives results with four possible arrangements of louver blades. Reference to Figs. 2e and 6 will assist in interpreting these data.

	Per Cent of Downward Output
Louver blades located to leave squares unobstructed	73
Louver blades covering dark partitions in one direction; across squares in the other direction	73
Louver blades crossing in center of squares	66
Louver blades covering bright grid lines in one direction; across squares in the other direction	66

It will be noted that the higher output value results if the louver blades in one direction cover the darker lines, regardless of whether the remaining blades cover the bright grid lines or cross in the centers of the squares.

Exterior applications of this lamp require the same considerations as apply to other fluorescent sources. To obtain good light output under moving air and low temperature conditions, it is necessary to enclose the lamp. However, since the compact lamp concentrates more wattage in a given area than do tubular fluorescent sources, the volume of

Figure 6. Two- by two-inch specular wedge louver. Cutaway view showing blades coinciding with grid lines of lamp.

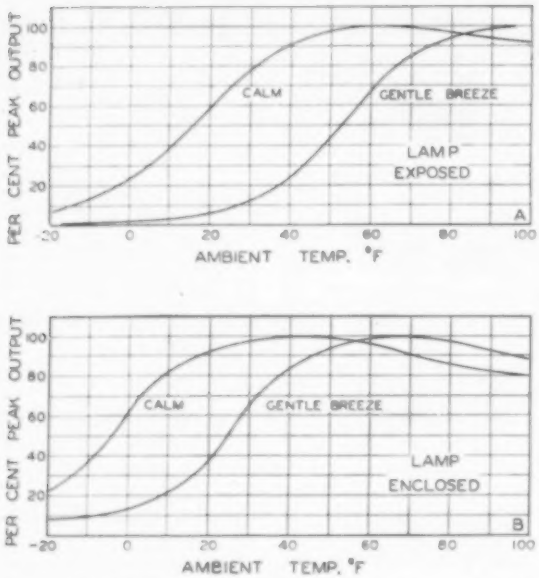

Figure 7. Performance at low temperatures, exposed and enclosed. Effect of still air and a light breeze.

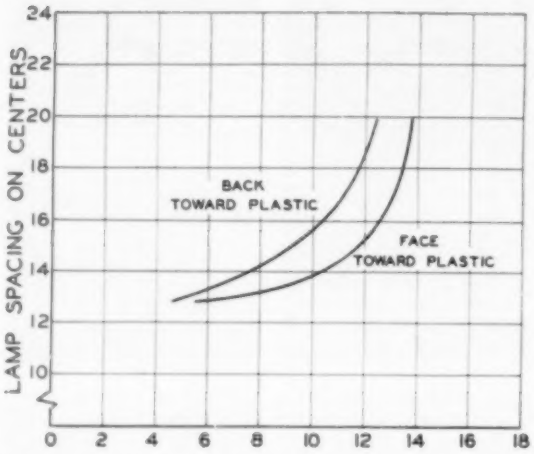

Figure 8. Relation between depth and lamp spacing for cavity covered with dense diffusing plastic (transmittance approximately 30 per cent).

enclosures will usually be less per watt, and there should be less drop-off in light output for the same ambient conditions in cold weather. Fig. 7 gives preliminary information on the variation of light output under outdoor conditions for a bare lamp and for one example of an enclosed unit.

Spacing Relationship for Uniform Brightness

When considering panel lamps as the light sources in a cavity behind a translucent panel, relationships as to spacing previously derived for virtually point or line sources will no longer be applicable. Lamps will ordinarily be mounted with their flat surfaces parallel to the diffusing cavity cover, and the lamp's area of 135 square inches will materially alter the spacing-distance ratio, as well as the interreflections within the cavity.

Tests have been made with nonreflectorized lamps and a single-face cavity. It was found that a distance of about three inches from lamp to back of cavity gave more effective use of cavity depth for uniformity of brightness, and at the same time gave the highest average brightness. Fig. 8 gives the spacing and distance from the plastic required for uniform brightness, for a mounting of lamps three inches from the back. The deep corrugations in the back of the lamp produce a broader spread of candlepower than is measured from the face. Accordingly, in a single-face panel, the over-all depth is less if the lamp is mounted with its face toward the back of the cavity.

Significance to the Lighting Art

This lamp adds a new dimension. Up until now, the designer of lighting and luminaires has had incandescent "point" sources, linear fluorescent sources, and open circles in mass-produced types. This compact fluorescent source expands the opportunities and will make a significant contribution to lighting practice and techniques of the future.

The authors gratefully acknowledge the assistance and contributions of their many associates. In the preparation of the paper, they wish to acknowledge the work of P. J. Underwood, Phelps Meaker, and Q. D. Dobras.

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2. Dobras, Q. D., and Phillips, D. R.: "Designing Low Brightness Luminaires For Higher Lighting Levels," ILLUMINATING ENGINEERING, Vol. LIV, No. 10, p. 627 (October 1959).

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- Operating Characteristics
- Environmental Testing
- Circuit Applications of

Plastic Electroluminescent Lamps

By J. C. DEVOL

The effects of voltage, frequency, temperature and humidity on the performance of plastic electroluminescent lamps are investigated in this paper. Also considered are the effects obtainable, and problems encountered in the application of such lamps to various electrical circuits. Future prospects of the plastic electroluminescent lamp are briefly discussed.

In the past few years a number of different types of electroluminescent lamps have reached the market. These lamps are most generally characterized by a rigid glass or metal substratum upon which several organic or inorganic layers have been superimposed.

This paper discusses an electroluminescent lamp which is sharply distinguished by its flexibility (¾-inch minimum bend radius), its thinness (less than $\frac{1}{32}$-inch thickness), its extreme light weight (3 ounces per square foot), its preponderance of organic materials, and finally, the ease with which it can be fabricated. Fig. 1 illustrates the great variety and complexity of possible shapes.

So much for its unique qualities. The more prosaic, but all important, performance characteristics of this lamp are examined below.

The major problem inherent in the development of a plastic electroluminescent lamp is the detrimental effect of humidity on lamp performance. It was long believed that no practical solution to this problem was possible—that there were no thin, transparent, organic materials available which would provide the necessary protection against moisture. It has been suggested that only an inorganic material such as glass could provide this protection. The plastic electroluminescent lamp under discussion embodies a thin, transparent, organic vapor barrier. This envelope will permit lamp operation under extraordinary humidity conditions (75°F, 85 per cent relative humidity) free of the effects of humidity for a period of one year. (See Table I for comparison with other plastic vapor barriers.) Under more normal conditions, this period can be expected to reach two to three years. Fig. 2 shows a plastic lamp and a ceramic inorganic lamp after operation at 120V-60cps for 1000 hours at 75°F, 85 per cent relative humidity. Note the local failure on the inorganic lamp shown at the right, while the plastic lamp has remained unaffected.

Temperatures as high as 300°F have little or no effect on the lamp structure; however, lamp brightness and maintenance are functions of temperature.

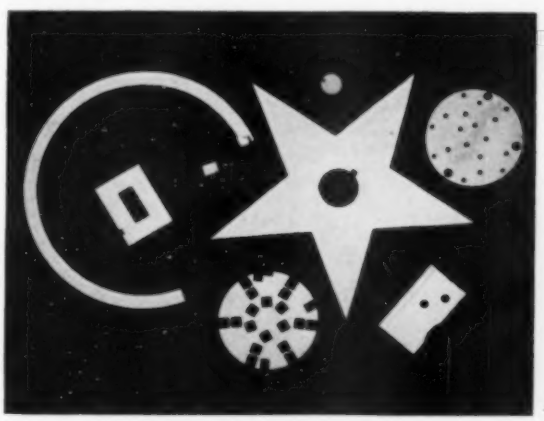

Figure 1. Various shapes of plastic electroluminescent lamps.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 24-29, 1961, St. Louis, Mo. AUTHOR: General Electric Co., Nela Park, Cleveland, Ohio. Accepted by the Papers Committee as a Transaction of IES.

Table I—Comparison of Plastic Vapor Barriers.

LAMP ENVELOPE (VAPOR BARRIER)	APPROXIMATE HOURS OF LAMP OPERATION AT 75°F, 85 PER CENT RELATIVE HUMIDITY. FREE OF HUMIDITY EFFECTS
.005-inch hi-density polyethylene	150
.005-inch unplasticized chlorotrifluoroethylene homo polymer film	500
Subject lamp envelope	8000

Fig. 3 shows the brightness-temperature relationship for green, yellow and blue lamps. While only initial data are shown, this relationship is believed to hold true throughout lamp life. Data on the white lamp are not given in this paper. Its characteristics are quite similar to those of the yellow lamp. Fig. 4 shows the magnitude of the effect of temperature on maintenance as evidenced in the performance of the green lamp. Fortunately, low temperatures have a beneficial effect on maintenance, and long-term operation is dependent upon the average temperatures encountered, rather than any seasonal highs or lows.

Having considered the effect of major climatic conditions upon lamp performance, attention is turned to the response of these lamps to various electrical parameters.

Fig. 5 illustrates the effect of operation voltage and frequency on lamp brightness and maintenance. In general, brightness can be increased only at a sacrifice of life. A fortunate exception to this is found in the different responses of the green and blue lamps to applied voltage. By doubling the applied voltage we obtain a two-fold increase in brightness at no sacrifice in life. An explanation of this phenomenon lies in the nature of the phosphors used and is beyond the scope of this paper.

Utilization of the marked improvement in luminous efficiency with age, displayed by the green

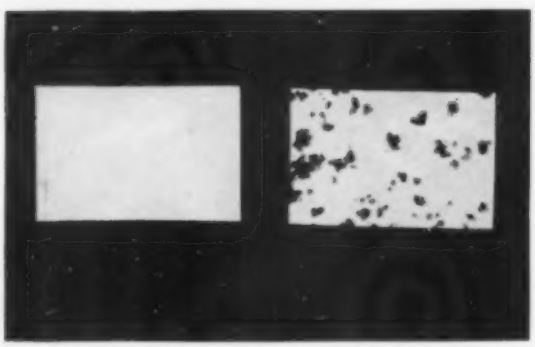

Figure 2. Plastic and inorganic electroluminescent lamps after high-humidity operation.

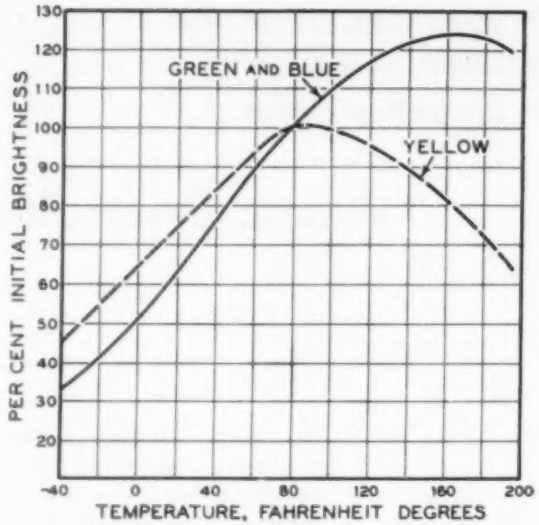

Figure 3. Effects of temperature on initial brightness, 120V-60cps.

lamp (Fig. 6), has led to some interesting techniques for extending useful lamp life.

A significant improvement in the time to half initial brightness at a small sacrifice in long-term brightness is obtainable by the addition to the lamp of a series resistance equal to initial lamp impedance (Fig. 7).

Another technique is demonstrated in Fig. 8. This curve is a plot of the performance of a lamp burned 2000 hours at 120V-60cps, followed by an additional 2000 hours at 240V-60cps. It appears that those light producing centers excitable at voltage stresses in excess of 120V were not affected by lamp operation below such stresses; in effect, this gives a second life to the lamp. This phenomenon can be utilized to provide a long-life, high-brightness lamp, as shown in Fig. 9. This graph illustrates a comparison of the operation of identical lamps,

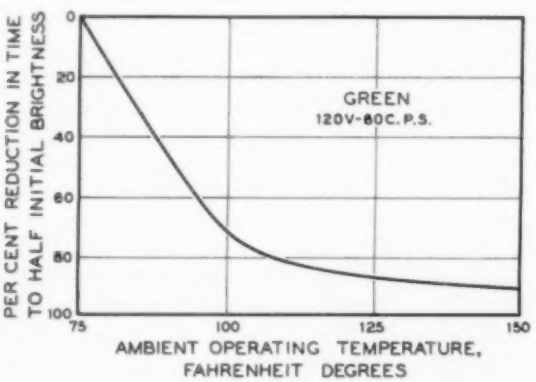

Figure 4. Effect of temperature on maintenance.

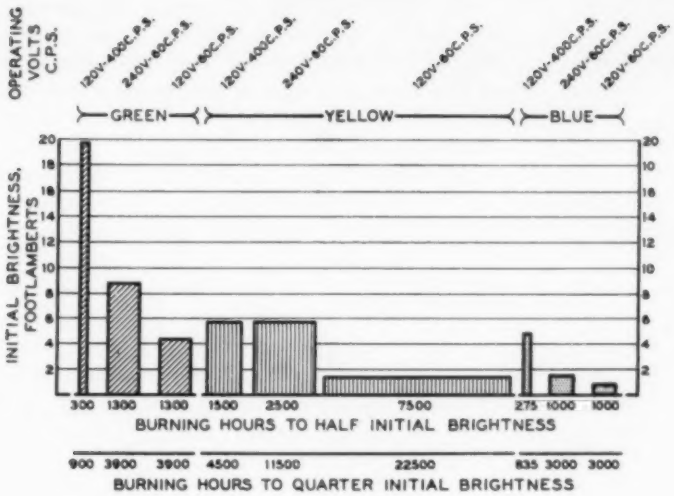

Figure 5. Effect of operating voltage and frequency on lamp brightness and maintenance.

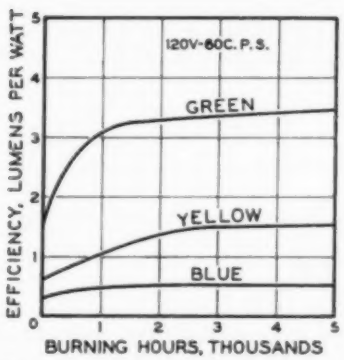

Figure 6 (above). Effect of age on luminous efficiency of lamps operated at 120V-60cps.

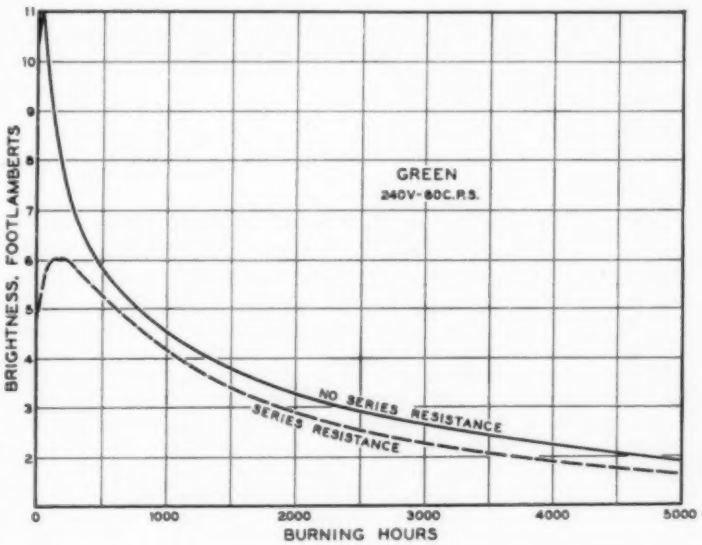

Figure 7 (right). Effect of series resistance on maintenance of green electroluminescent lamps operated at 240V-60cps.

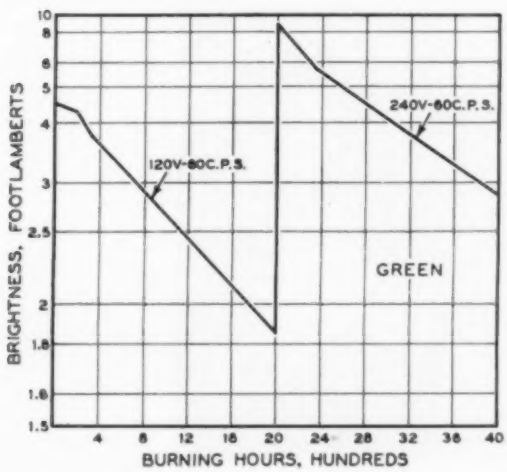

Figure 8 (left). Lamp life was extended by increasing applied voltage.

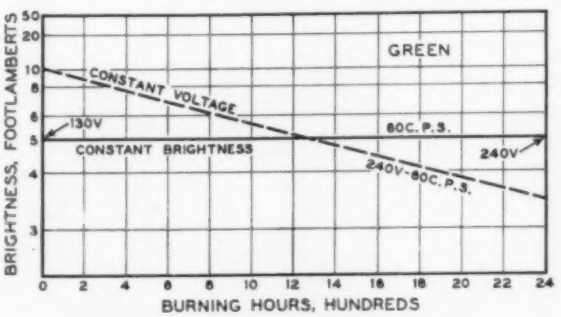

Figure 9 (above). Constant voltage vs. constant brightness.

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one set at constant voltage, the other maintained at constant brightness, obtained by gradually raising applied voltage from 130V to 240V to compensate for depreciation. This technique, while limited eventually by the breakdown voltage of the lamp, promises much for the future. Some combination of a brightness-controlled, variable transformer or other circuit element, which accomplishes this end, could well be the answer to high brightness and long life, presently a very elusive objective.

While the electroluminescent lamp has several unique advantages over conventional light sources, it also has definite limitations, particularly with regard to high brightness and maintenance of high brightness. Its use for general lighting purposes appears to be out of the question, excluding a major technological breakthrough. Consequently, electroluminescent lamps will likely find application in situations which exihibt one or more of the following attributes:

(1) ambient light levels that are low enough to ensure a satisfactory contrast between the electroluminescent lamp and the lamp's background;

(2) uniform surface brightness is important;

(3) brightness in excess of that attainable with electroluminescent lamps is unnecessary and low power consumption per unit of lighted area is important;

(4) space or weight requirements or both indicate an essentially two-dimensional light source;

(5) applications exhibiting severe mechanical shock and vibration.

Examples of such applications might include: point of sale displays such as may be found in show windows, restaurants, and cocktail lounges; highway markers; street signs; house numbers; night lights; Christmas decorations, both indoor and outdoor; and aircraft, space, motor vehicle instrument and indicator lighting.

It is very likely that the most widespread and successful use of electroluminescent lighting will not be as a substitute for more conventional light sources but in areas which today are not even recognized as potential applications.

High Level Lighting Creates "Brand" Image

Dramatic levels of lighting to develop "brand" desire in customers was the basic aim of this installation for The Indiana Oil Co., Schenectady, N. Y. The company is an independent-brand gas station that has to compete with major brands. As the owner is selling a high quality product he did not want to use gaudy signs. Instead of conventional station lighting consisting of a few perimeter floods and accents on pumps, this job used massed high power street lights, across 250 feet of frontage. A twenty-five-foot steel street lighting pole with twin six-foot bracket arms which support 1000-watt improved-color mercury lights was placed on each of the eight islands. Ballasts were mounted inside the building with secondary leads to the poles.

The results were spectacular. Sales were 25 per cent greater than anticipated. Illumination measurements averaged 25 footcandles in a 30-foot area on each side of the poles; these values decreased gradually to five footcandles at the lot's boundaries. This ALC entry won first prize in the Eastern New York Section, Northeastern Region, and was submitted by Robert Bishop and Randall H. Rice, Westinghouse Electric Corp., Albany, N. Y.

A.I.A. File No. 31 f

INSTALLATION AT
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Lighting a Women's Specialty Shop

LIGHTING OBJECTIVE: To provide general and supplementary illumination for the display and sale of women's wear and accessories in a long narrow store.

GENERAL INFORMATION: The merchandising and sales area of this store measures 19 feet 6 inches wide (wall to wall) by 65 feet long with a ceiling height of 9 feet 10 inches. Colors and reflectances of the major room surfaces are: ceiling, off-white acoustical plaster (55 per cent reflectance); walls, antique white (65 per cent reflectance); and floor, tan carpet (20 per cent reflectance).

INSTALLATION: After 90 days' service the average general level of illumination in the circulation areas was 110 footcandles. This was provided by seven Globe catalog No. DV-8206-48RS two- by four-foot surface-mounted four-lamp luminaires and 14 Globe catalog No. DV-8446-48RS four- by four-foot surface-mounted six-lamp luminaires. These units, equipped with two- by two-foot formed plastic diffusers and 40-watt T-12 deluxe cool white lamps, are located in three rows lengthwise; the two outside rows consist of seven six-lamp units on 10-foot centers and the center row consists of seven four-lamp units also on 10-foot centers. The three rows are spaced on five-foot centers.

Additional illumination is provided at merchandising areas by four surface-mounted hood type units, equipped with 150-watt R-40 spot lamps, located between luminaires in the front portion of the store (two are shown in photo). Lighting of wall shelves and racks is supplemented by continuous rows of fluorescent lamps installed beneath the decorative canopies.

Brightnesses of the major room surfaces after 90 days' service were: fluorescent luminaire at 45 degrees, 480 fL; ceiling, 25 fL; walls, 40 fL; floor, 12 fL; display rack, 50 fL.

Lighting designed by R. J. Huff, Lighting Adviser, San Diego Gas & Electric Co., San Diego, Calif.

Lighting data submitted by R. J. Huff as an illustration of good lighting practice and to aid in the design of similar installations.

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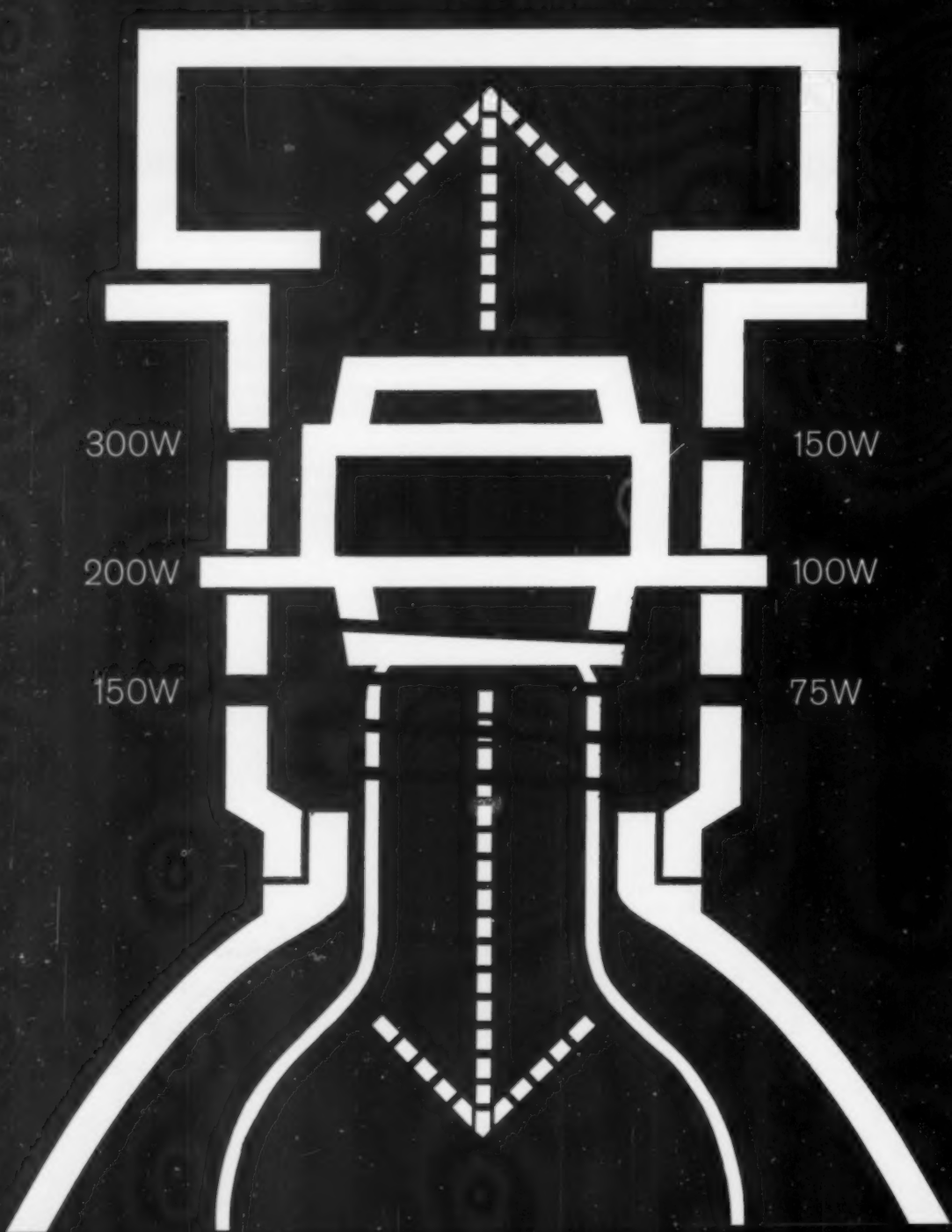


LIGHTING NEWS

Franklin Institute Establishes Science Information Service

A Science Information Service, designed to assist industry and scientific institutions in the implementation of research and development projects, has been organized by the Technical Library of the Franklin Institute, Philadelphia. According to John P. McGowan, library director, the new service aims to provide literature searches to help researcher reduce laboratory time and avoid the duplication of research.

Literature searches, available in any area of engineering, mathematics, physics, chemistry and industrial processing, will include bibliographic compilations, annotated bibliographies, monitoring of current literature, abstracting on a regular basis, and translations.

The Science Information Service will make use of the resources of the Franklin Institute Library which contains more than 200,000 scientific and technical reference volumes, a collection of technical reports and approximately 5,000,000 patents from the United States, Great Britain, Canada and many western European nations, national and foreign abstracting services, and subscriptions to some 2500 scientific journals, about 30 per cent of which are foreign.

Detailed information on the Service may be obtained from Alec Peters, Science Information Service, The Franklin Institute, Benjamin Franklin Parkway at 20th St., Philadelphia 3, Pa.

Site of NEMA Annual Meeting Changed to Plaza Hotel

The 35th annual meeting of the National Electrical Manufacturers Association has been relocated at The Plaza, Fifth Avenue and 59th Street, New York City. The date of the meeting, November 16, 1961, remains unchanged.

Change in the location of the meeting, originally scheduled for New York's new Summit Hotel, was necessary because the Summit's ballroom, as completed, is not suitable for the large NEMA membership luncheon, business meeting and industry presentation. Division and Section meetings, scheduled to be held at the Summit during the week of November 12, will not change locations.

Keynote address at the annual meeting will be delivered by A. D. R. Fraser, NEMA president and president of Rome Cable Division, Aluminum Co. of America. Also scheduled is a report on the Room Air-Conditioner Section's new voluntary Certification Program.

Southern Optometry College Boasts Largest IES Student Group

Forty student members of IES at the Southern College of Optometry, Memphis, Tenn., constitute the only IES student group sponsored by an optometric school. The IES Chapter, organized as a supplement to the student's course work in illumination, aims to increase student understanding of the vision problems caused by inadequate illumination.

Officers of the chapter, all seniors at the College, are: Fred Ehrlich, chairman; Roger DuHon, vice-chairman; Robert Ballou, secretary-treasurer. Dr. M. E. Broom, dean and acting-president of SCO, serves as faculty adviser.

In addition to the chapter at Southern Optometry, IES has student branches at other colleges and universities with a total membership of 90. Student membership, for annual dues of $5.00, is available to any student registered in a college or university for study leading to a degree. Privileges include the receipt of IE and other Society mailings.

Planning Guides Distributed for National Electrical Week

Planning guides and sample materials developed for the 1962 observance of the seventh consecutive National Electrical Week, February 11-17, were mailed in mid-October to approximately 5000 industry groups in the United States and Canada. As in past years, the materials include speeches, mats, repro proofs, Edison replica lamps, pamphlets and general display items. In addition, the Committee

SENIOR student members of Southern College of Optometry IES Chapter at start of 1961-62 academic year. L. to r., bottom row: Howard Hall, Robert Ballou, Roger DuHon, Fred Ehrlich, Dr. M. E. Broom, faculty adviser. Second row: William Watson, William Denson, Anton Young, Ray Haddon, Wayne Cannon. Third row: Joseph Lamendola, Gerald Ritzheimer, Richard Ray, Lynn Church, William Hamilton. Back row: Howard Smalling, Forrest Abernathy, Perry Nelson, James Lewis, Robert Sams, Ross Averitt. Membership of the student group is 40.

BLUE ELECTROLUMINESCENT lamps are replacing incandescent sources as identification for emergency telephones and alarm boxes in the New York City Independent subway system. Making the first changeover are Charles L. Patterson (left), chairman of the New York Transit Authority, and D. Y. Smith, vice-president and general manager, RCA Electron Tube Division. Although initial cost of the electroluminescent lamps is approximately three times that of incandescent, the longer life and lower power consumption of the electroluminescent source is expected to result in an annual saving of $29,400.

will offer decals featuring the National Electrical Week theme, "Electricity Powers Progress," placemats with a brief electrical quiz and information about the Week, and two new pamphlets designed for students, "How to Make a Simple Buzzer and Code Key" and "How to Make a Simple Electric Battery."

Following the initial free distribution of planning guides, additional copies will be available for purchase from National Electrical Week Committee, Suite 306, 407 N. 8th St., St. Louis, Mo.

Tungsten Development Reported

A new practical method for producing large single crystals of tungsten of extremely high purity and density has recently been reported by the Westinghouse lamp parts department. Tungsten rods 10 inches long and 0.2 inches in diameter are being produced as single crystals. According to the report, special refining techniques which make it possible to grow these ultra-high purity crystals in predetermined crystalline forms with a purity up to 99.9975 per cent have been developed. The large tungsten crystals are big enough to permit the commercial fabrication of small parts from them.

Tungsten is usually considered a hard brittle metal, very difficult to machine or fabricate. In this new development, however, ultra-pure crystals are actually ductile, even at temperature of —330°F.

The development of the large single crystals was the product of basic research on the properties of tungsten, a key component in lamps. The material is expected to have application in rocket motors.

New York, New Jersey Sections Offer Fundamentals Courses

First sign of the renewal of IES Section/Chapter activity after the summer vacation is the announcement of lighting courses, one of the most important Society activities on the local level. These courses, designed to provide lighting engineers, electrical contractors, architects and designers with a practical understanding of modern illumination principles and techniques, play a major role in spreading knowledge of illuminating engineering.

The New York and New Jersey Sections began their fundamentals of illumination courses during the early part of October. Both the ten-week New York course and the 12-week New Jersey school cover the theory of scientifically designed lighting, as well as practical design techniques for commercial and industrial installations.

As in past years, Section members serve as instructors for the courses. Course chairmen are T. S. Madonia, New Jersey, and J. F. Dickerhoff, New York.

'59 Electrical Code Amendments Now Available for Review

Proposed amendments to the 1959 National Electrical Code, recently published in a 390-page book by the National Fire Protection Association, are available for review by electrical manufacturers, inspectors, contractors and others in the industry. Comments on all proposed revisions, which affect a variety of commercial, industrial and residential installations, must be submitted to the chairman and secretary of the Code Committee and to the listed chairmen of each Code Making Panel by December 1, if they are to be considered in the final review for the 1962 edition of the Code.

Copies of the proposed changes, No. 70-PR-1961, may be obtained from the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., at a cost of $2.50 each.

Program Announced for Meeting of NEMA Lighting Equipment Division

Highlight of the program at the November 13-15 meeting of the Lighting Equipment Division of the National Electrical Manufacturers Association will be a preview of lighting plans for the 1964-1965 New York World's Fair. General William Whipple, Jr., chief engineer of the New York World's Fair Corp., will be the featured speaker.

Also scheduled for the meeting are talks on lighting markets and trends by Berlon C. Cooper, associate editor, *Electrical Construction and Maintenance*, and "the profit squeeze," by Robert B. King, Profit Counselors, Inc.

The meeting of the Lighting Equipment Division will be held at the Belmont-Plaza Hotel in New York City, just prior to the NEMA Annual Meeting on Novem... 16.

Industrial Lighting Conference Planned by Chicago Institute

The Chicago Lighting Institute, in conjunction with *Plant Engineering* magazine, has scheduled a full-day conference on industrial lighting for November 16, 1961. The conference program, featuring talks by nine prominent lighting engineers on all aspects of industrial lighting, includes:

Illumination Levels in Industry According to IES Standards—B. S. Benson, Jr., Benjamin Division, Thomas Industries, Inc.

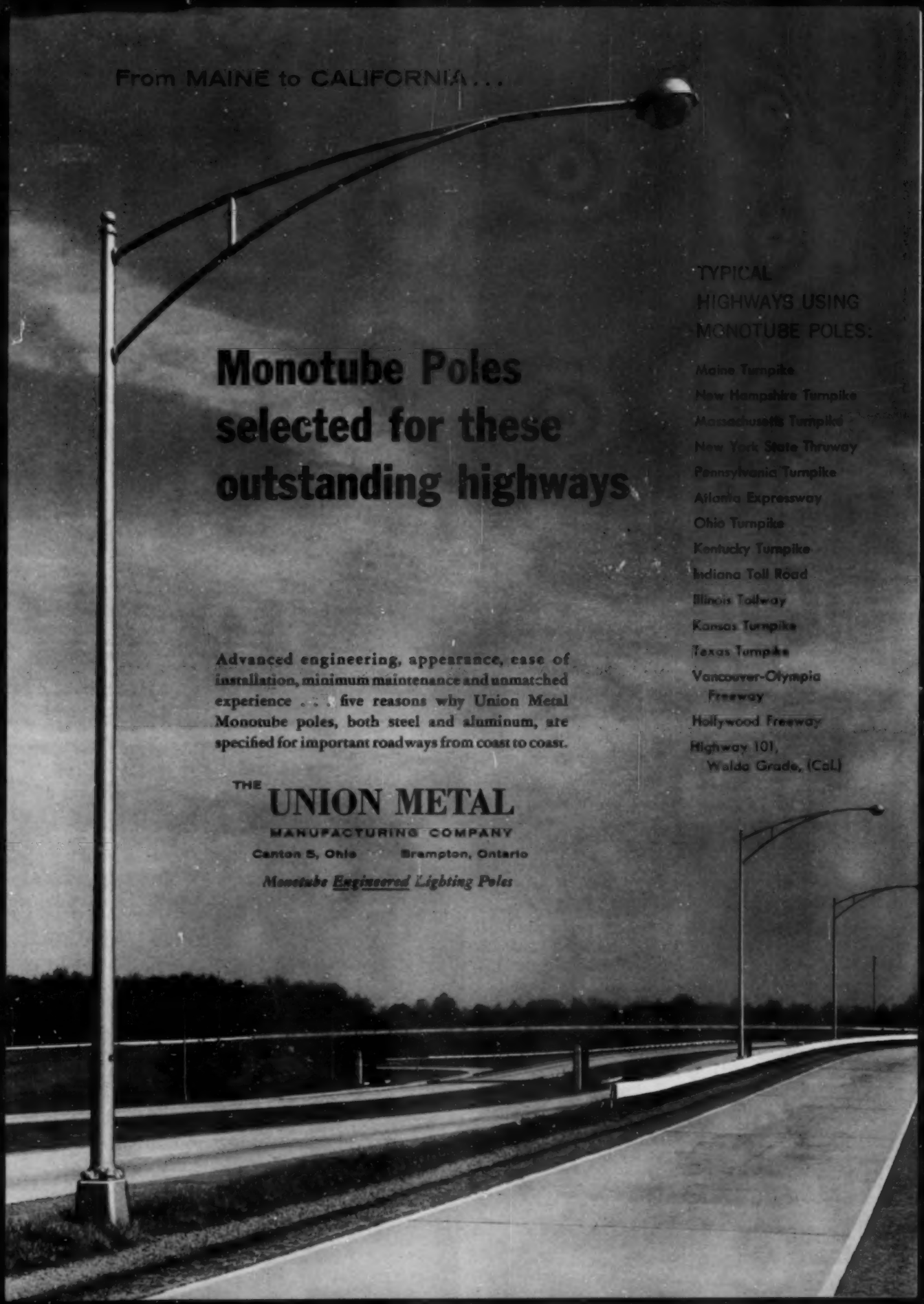
Characteristics and Types of Light Sources Used in Industry—R. L. Allen, Westinghouse Electric Corp.

Lighting Outdoor Industrial Property—W. W. Weld, Revere Electric Manufacturing Co.

High- and Low-Bay Areas—A. W. Lange, Holophane Co.

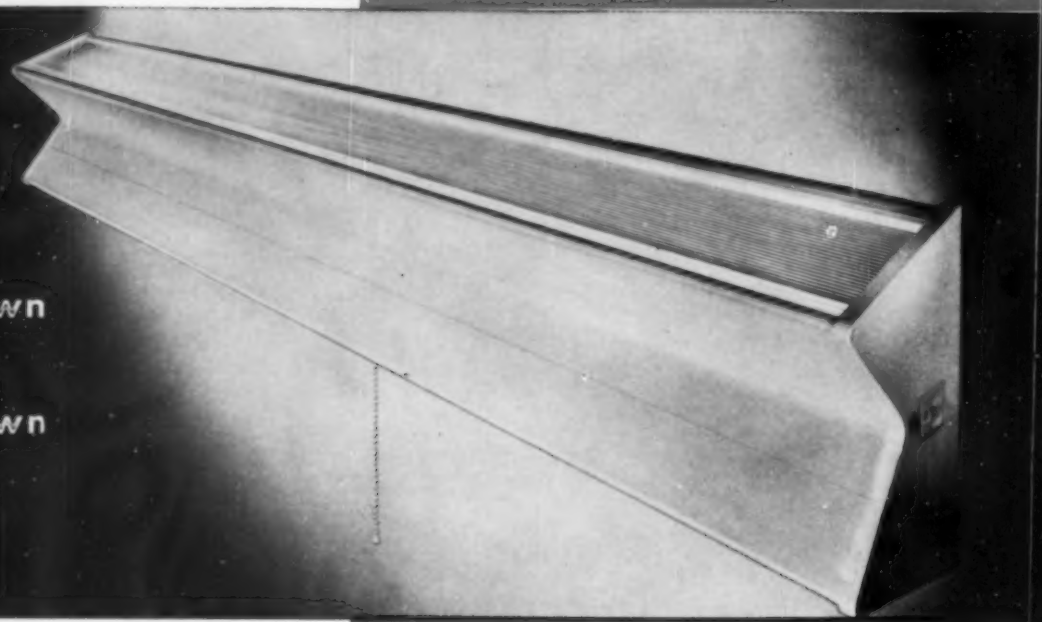
Maintenance Schedule and Group Replacement —Lawrence Creech, Lease Lite Corp.

(Continued on page 13A)


From MAINE to CALIFORNIA...
Monotube Poles selected for these outstanding highways
TYPICAL HIGHWAYS USING MONOTUBE POLES:
Maine Turnpike
New Hampshire Turnpike
Massachusetts Turnpike
New York State Thruway
Pennsylvania Turnpike
Atlanta Expressway
Ohio Turnpike
Kentucky Turnpike
Indiana Toll Road
Illinois Tollway
Kansas Turnpike
Texas Turnpike
Vancouver-Olympia Freeway
Hollywood Freeway
Highway 101, Waldo Grade, (Cal.)
Advanced engineering, appearance, ease of installation, minimum maintenance and unmatched experience . . . five reasons why Union Metal Monotube poles, both steel and aluminum, are specified for important roadways from coast to coast.
THE UNION METAL MANUFACTURING COMPANY
Canton 5, Ohio Brampton, Ontario
Monotube Engineered Lighting Poles

miller

MULTI-PURPOSE WALL LIGHT



- Lights Down
- Lights Up and Down
- Lights Up

Here's a new fluorescent fixture that offers the ideal solution to many special, wall mounting lighting applications. Switched units provide a choice of *up-light*, *down-light* or both *up* and *down* light depending on the lighting need.

When *up-light* and *down-light* are used together, you get a desirable balance of direct light for reading, writing or working, with soft, comfortable general room illumination.

Ideal for lighting the areas illustrated—as well as for private offices, lounges, apparel fitting rooms and similar locations. Equally desirable for new buildings or modernization of older areas. Comes in 2, 3 and 4 foot lengths for individual or continuous wall mounting.

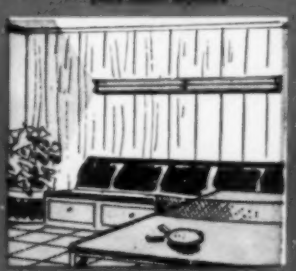
Premium quality *acrylic refractors at no premium in price*, softly diffuse the light—will never discolor. All switched units are equipped with a convenient, built-in electric outlet. A built-in night light is optional. Easy to relamp and clean.

For complete catalog information, write Department 1061 or contact your Miller Representative.

Hospital Beds and Metal Rooms

Wash Rooms and Bath Rooms

Home Study Areas



Recreation Rooms

Entryways

Stairwells

LIGHTING BY miller SINCE 1844

THE **miller** COMPANY
MERIDEN, CONNECTICUT • UTICA, OHIO

(*Continued from page 10A*)

Making a Lighting Layout—Willard Allphin, Sylvania Electric Products Inc.
Lighting in Hazardous Locations—O. A. Cavanagh, Underwriters' Laboratories.
Lighting, Heating, Cooling—J. M. Johnsen, The Pyle-National Co.
Good Industrial Lighting Makes Common Sense—J. R. Chambers, Appleton Electric Co.

An open-end discussion period, moderated by Vern Kempf, electrical editor of *Plant Engineering*, will follow the formal speakers' program.

Registration information for the conference, which will be held at the Institute's headquarters, may be obtained from Chicago Lighting Institute, 140 South Dearborn St., Chicago 3, Ill.

California Electric/Lighting Show Scheduled for March 28-31

The 11th Biennial Electrical Industry Show and Lighting Exposition, sponsored by the Electrical Maintenance Engineers Association of California, will be held at the Shrine Exposition Hall in Los Angeles, March 28-31, 1962. The show, which is directed at an audience from the 13 western states, is being organized under the chairmanship of Charles H. Hays, a past-president of the Electrical Maintenance Engineers Association, with Fred L. Tabery serving as exhibit manager.

The lighting conferences and exposition, inaugurated at the 1960 show, will be devoted to commercial and industrial lighting. Urban Beh, consulting illuminating engineer, has been named chairman of the illumination conferences.

The 1960 Electrical Industries Show drew an attendance of 6000, with 1365 registered for the lighting conferences.

It Seems to Me . . .

Calculations Questioned in Low-Budget School, June IE

The article "Designing for a Low-Budget School," by Alfred A. Binder and Gerard J. Oakley (pp. 373-375, June IE) contains several statements which are rather hard to believe. In particular, the data on page 375 in the paragraph beginning "Although the most interesting installation. . . ." indicates either a major breakthrough in luminaire design or a complete lack of understanding of standard terminology and techniques of measurement.

In this paragraph, the authors claim that a new luminaire delivers 100 footcandles for the same price as the originally budgeted 50 footcandles and, in addition, provides recommended brightness ratios and passes the "scissors curve."

Although no actual room dimensions are provided, the photograph on page

(*Continued on page 16A*)

SCHEDULED EVENTS

Dates of Interest to IES Members

1961

November

November 6-8—National Warm Air Heating and Air Conditioning Association, Annual Convention, LaSalle Hotel, Chicago, Ill.

November 7-9—Eighth Industrial Electric Exposition, Penn-Sheraton Hotel, Pittsburgh, Pa.

November 9-10—IES Council Meeting, United Engineering Center, 345 East 47th St., New York, N. Y. Members are invited to attend meetings of Council as guests.

November 9-10—Highway Engineering Conference, University of Florida, Gainesville, Fla.

November 13-15—Lighting Equipment Division, National Electrical Manufacturers Association, Annual Meeting, Belmont-Plaza Hotel, New York, N. Y.

November 16—National Electrical Manufacturers Association, Annual Meeting, Plaza Hotel, New York, N. Y.

November 24-29—1961 Electrical and Home Appliance Show, Electric Building Balboa Park, San Diego, Calif.

November 28-30—Building Research Institute, Fall Conference, Mayflower Hotel, Washington, D. C.

1962

January

January 22-25—National Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Pa.

January 25-27—National Society of Professional Engineers, King Edward Hotel, Jackson, Miss.

January 29-31—American Society of Heating, Refrigerating and Air Conditioning Engineers, Semi-Annual Meeting, Chase Park Plaza, St. Louis, Mo.

January 29-February 2—Electrical Engineering Exposition, sponsored by the American Institute of Electrical Engineers, New York Coliseum, New York, N. Y.

January 30-February 2—Society of the Plastics Engineers, Annual Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.

February

February 5-9—American Society for Testing Materials, Statler-Hilton Hotel, Dallas, Texas.

February 6-8—Society of the Plastics Industry, Reinforced Plastics Division Conference, Edgewater Beach Hotel, Chicago, Ill.

February 8-9—IES Council Meeting, United Engineering Center, 345 East 47th St., New York, N. Y. Members are invited to attend meetings of Council as guests.

March

March 2-4—20th National Home Improvement Exposition, New York Coliseum, New York, N. Y.

March 9-11—National Electrical Industries Show, New York Coliseum, New York, N. Y.

March 15-17—Optical Society of America, Spring Meeting, Mayflower Hotel, Washington, D. C.

March 28-31—Eleventh Biennial Electrical Industry Show, sponsored by Electrical Maintenance Engineers Association of California, Shrine Exposition Hall, Los Angeles, Calif.

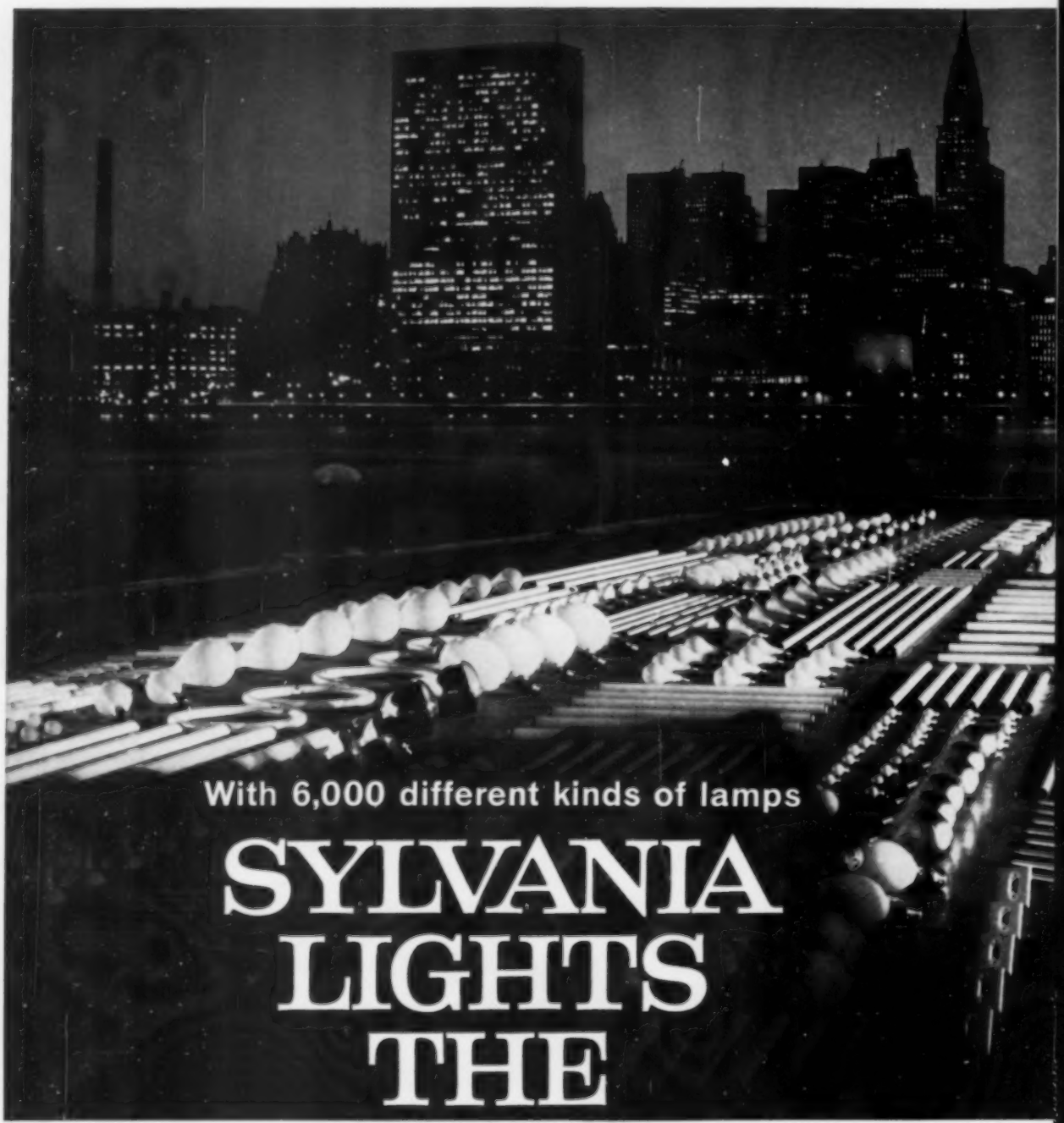
April

April 2-4—Edison Electric Institute Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill.

1962 Conference Paper Outlines Due January 31

The IES Papers Committee announces that outlines of proposed papers for the 1961 National Technical Conference in Dallas must be submitted by January 31, 1962. Outlines should be sent to:

Benjamin S. Benson, Jr.
Chairman, IES Papers Committee
Benjamin Division, Thomas Industries, Inc.
Des Plaines, Ill.



With 6,000 different kinds of lamps

SYLVANIA LIGHTS THE WAY

From a world leader in light, a steady stream of new and better ways to light your home, your business and your world

At Sylvania we're in friendly competition with the sun. For more than 59 years we've made it our business to push back the darkness and bring in the light.

Today, we make more than 6,000 different kinds of lamps to serve the world's growing and almost unlimited needs for light.

Just consider our family of fluorescent lamps, for example. Back in 1938, Sylvania brought fluorescent lighting to the market. In the intervening years we've pioneered more than a dozen major improvements in fluorescent lighting. Recently we introduced a VHO Powertube fluorescent that gives more light than a lighthouse. Our latest is a new "Natural White," the first fluorescent to make colors look real and truly lifelike.

Tomorrow, we'll have *hundreds* of new Sylvania lamps to show you. If you need lamps that are better, brighter, or more economical, see Sylvania. Wherever there is darkness—there is a Sylvania lamp to light the way.

SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS

Lighting Division, Sylvania Electric Products Inc., Dept. 61, 60 Boston Street, Salem, Mass. In Canada: Sylvania Electric (Canada) Ltd., Montreal.

(*Continued from page 13A*)

375 indicates a classroom approximately 28 feet wide with a 10-foot ceiling. For estimating purposes, a length of 36 feet is assumed. Minor deviations from these approximate dimensions will not materially affect the results.

In order to provide 100 footcandles maintained in this room with good reflectances and maintenance a coefficient of utilization of 1.035 would be required, as indicated by the calculations below. This, of course, is ridiculous.

Perhaps the 100 footcandles is to be considered as the initial level, in which case the coefficient of utilization is .725. While this value may be theoretically possible, it is 20 per cent higher than the utilization of the best surface-mounted unit that we have encountered. If the values stated are initial, this fact should be indicated, since maintained illumination is generally understood unless otherwise specified.

This very high coefficient of utilization becomes even less believable when coupled with a statement that the unit meets the scissors curve. To satisfy the limitations of the scissors curve with surface-mounted equipment is very difficult. To do so requires that luminaire output at high angles be almost eliminated. This, in turn, reduces efficiency and narrows the distribution. To claim, then, that a unit passes the scissors curve and has a coefficient of utilization of .725 (assuming initial levels) in this area appears to be impossible.

It is suggested that all data for both the luminaire and the installation be studied carefully. If the authors have, indeed, accomplished the results which they claim, they should be congratulated by each and every one of us. If, on the other hand, the data are incorrect, the actual facts should be published in ILLUMINATING ENGINEERING at the earliest possible date.—THEODORE AKE, Director Technical Data and Training, The Miller Company, Meriden, Conn.

CALCULATIONS

Assumptions

Room Size: 28' x 36' x 10'

Room Ratio: 2.1

Reflectances: Ceiling, 80%; Floor, 30%; Walls, 30% (including chalkboard and windows).

Maintenance: Good, .70 (per *IES Lighting Handbook*)

Units: 3 rows (per article), of 8 four-foot, two-lamp rapid-start units per row.

Generated Lumens

= 24 units × 5800 lumens per unit
= 139,000

Required Lumens Maintained =

$$\frac{fc \times \text{area}}{MF} = \frac{100 \times 28 \times 36}{.70} = 144{,}000$$

Required Lumens Initial =

$fc \times \text{area} = 100 \times 28 \times 36 = 101{,}000$

Coefficient of Utilization =

$$\frac{\text{Required Lumens}}{\text{Generated Lumens}} = 1.035 \text{ maintained, } .725 \text{ initial.}$$

ABOUT PEOPLE

Ralph M. Evans, director of the Color Technology Division of Eastman Kodak Co., Rochester, N. Y., has been named recipient of the Herbert T. Kalmus Gold Medal Award of the Society of Motion Picture and Television Engineers. Mr. Evans was cited for his work in color photography since 1928, and his studies in the field of visual perception of color.

Eugene G. St. Jean, president of St. Jean Lighting Maintenance, Inc., and St. Jean Electrical Co., West Springfield, Mass., was elected president of the National Association of Lighting Maintenance Contractors. He succeeds **H. Galbraith** of Approved Lighting Service, Cedar Rapids, Iowa. Chosen as secretary-treasurer, was **William C. Abrams** of Eveready Electric Co., San Francisco. Newly appointed regional vice-presidents are: **John Razzano**—eastern region; **Edward I. Creed**—central; **William Kelly**—southern; **Ken Purington**—mid-western; and **Lin Best**—western.

The appointment of **Lester M. Benjamin** as market development director, has been announced by **Will Turner,** vice-president, of the Progress Manufacturing Co., Philadelphia. He was formerly vice-president of Kingsford Ornamental Building Products Co., Pittsburgh, Pa.

General Electric's Residential Market Development Operation, Louisville, Ky., has announced several staff changes. **Dabney Tunis** has been made manager, and **Richard O. Parrish,** specialist, of advertising and sales promotion. Mr. Tunis succeeded **John F. Hippen** who has been named western regional manager. Mr. Parrish replaced **Wally Ross** who is now northeastern electric comfort heating specialist for G-E's Wiring Devices Department.

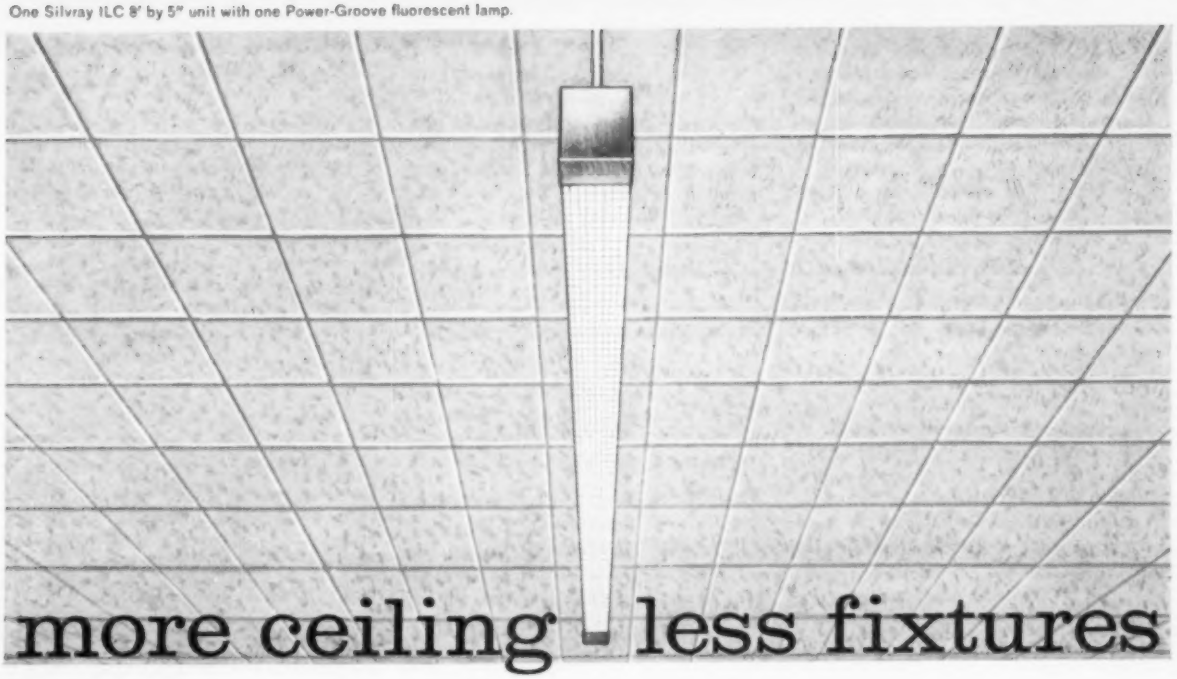
The American Institute of Electrical Engineers announced the recipients of five engineering awards. They are: **George F. Corcoran,** professor of electrical engineering, University of Maryland—Medal in Electrical Engineering Education; **Samuel B. Griscom,** advisory engineer, Westinghouse Electric Corp., East Pittsburgh—the William M.

(*Continued on page 18A*)

MOVING DAY at IES Headquarters. Photo at left: facing camera amidst sea of cartons that was staff's first view of new IES offices in United Engineering Center are Betty Hicks (left) and Janet Anthony of the technical department. Visible at top of photo is first published view of the then-unfinished luminous ceiling system designed to supply 200 fc in general office area (see story, p. 588). Photo at right: having amassed an impressive collection of unwrappings, C. E. Ellis, IE advertising and promotion manager, is almost "out from under."

Three conventional 1' by 4' flush troffers each with two 40-watt fluorescent lamps.

One Silvray ILC 8' by 5" unit with one Power-Groove fluorescent lamp.



more ceiling less fixtures

With Silvray's ILC (Indirect Luminous Ceiling) the lighting equipment will occupy 75% less ceiling space than by using conventional fixtures with equivalent illumination. You'll get semi-indirect quality light, with less fixtures, less installation costs, less maintenance costs—but greater opportunity for better design and resultant aesthetics.

Fill in and mail coupon for enlightening facts about ILC for architects, designers and engineers.

Silvray Lighting, Inc.
Dept. # 3
Bound Brook, N. J.

Gentlemen:

Please send me by return mail new comprehensive illustrated brochures.

☐ "ILC Lighting Engineered for the Architect."
☐ "New Lessons in School Lighting."

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Installations in the News . . .

First Lighting Installed at Old Woodbine

Significant feature in the remodeling of Old Woodbine race track, Toronto, was the installation of a modern lighting system—the track's first—designed to provide levels up to 80 fc at and near the rail. Floodlighting units equipped with Alzak reflectors and 1500-watt quartz iodine incandescent lamps were specially designed to confine light distribution to the track surface with sharp cutoff at the rail. High efficiency, a minimum of spill light and exceptionally uniform light distribution in the direction of travel characterize the installation. Fixtures are mounted in pairs on poles tilted at an angle of 15 degrees along the inside of the track. Pole spacing is on approximately 25-foot centers.

Lighting for the home stretch—to 55 fc—is from fixtures mounted along the front edge of the grandstand roof. Illumination is concentrated on track with only enough spill light for a 10-fc level on the apron. Photo and data courtesy of Canada Electric Co., Ltd.; McGregor Associates, Ltd., both of Toronto.

(*Continued from page* 16A)

Habirshaw Award for his contributions to lighting short circuit protection; **Theodore A. Rich,** consulting engineer, General Electric Co., Schenectady, N. Y. —Morris E. Leeds award for his contributions to measurement; **Harry Nyquist,** Millburn, N. J., retired Bell Telephone Laboratories engineer—Mervin J. Kelly Award for his contributions to modern communication and control theories; and **Charles R. Townes,** professor of physics at Columbia University — The David Sarnoff Award for research in resonance physics.

Ward Leonard Electric Co., Mount Vernon, has named **Merquip Electronics, Inc.,** Chicago, Ill., as its authorized distributor in that area.

Richard L. Jandl has been made vice-president and general sales manager of Sola Electric Co., Elk Grove Village, Ill., a division of Basic Products Corp. He was formerly distribution manager of the Tung-Sol Electric Co., Inc. Mr. Jandl has replaced **Leonard C. Marschall,** who remains as executive vice-president. Also announced by Sola was the appointment of **Dynamic Industries Sales Corp.,** Detroit, Mich. as its Michigan representative.

The Rotuba Extruders, Inc. (division of Waljohn Plastics, Inc.), Brooklyn, N. Y., announced the recent appointment of **Stanley Winton** as manufacturer's representative in Illinois, Wisconsin and Indiana.

Donald C. McCormack, director of research and product development for J. A. Wilson Lighting Ltd., Toronto, represented Canada as Chief Delegate to the General Assembly of the International Council of Societies of Industrial Designers, held in Venice, Italy, during September. Mr. McCormack presented a report on the advancement of product development in Canada. The International Council is interested in establishing standards and exchanging information on the development of new products.

National Bureau of Standards, Washington, D. C., has announced the appointment of two new associate directors, **Dr. Charles M. Herzfeld** and **William A. Wildhack.** Dr. Herzfeld, who will be responsible for long range planning and coordination of the Bureau's program of physical standards and measurements in his new post, will continue to serve in his former position as chief of the heat division, until a successor is appointed. Mr. Wildhack, who previously served as special assistant to the director, will now be responsible for coordination of NBS measurement services. He is a former president of the Instrument Society of America.

Sunbeam Lighting Co., Los Angeles, Calif., and Gary, Ind., has announced the addition of two new sales representatives. **Dale Brown,** Salt Lake City, Utah, will represent the company in Utah and Montana; **C. J. Dutcher,** Seattle, Wash., will cover the state of Washington.

Jac & Meyer Co., Inc., Mount Vernon, N. Y., has been appointed sales and engineering representative of the newly organized firm of General Tapered Products, Inc., Garfield, N. J. They will represent the company's Outdoor Lighting Division for sales of lighting standards.

Deaths

Samuel Botvinick, Eastern Pennsylvania Section.
Raymond P. Connors, New York Section.
Vincent Farrey, Southeast Florida Section.
William L. Willson, Tennessee Valley Section.

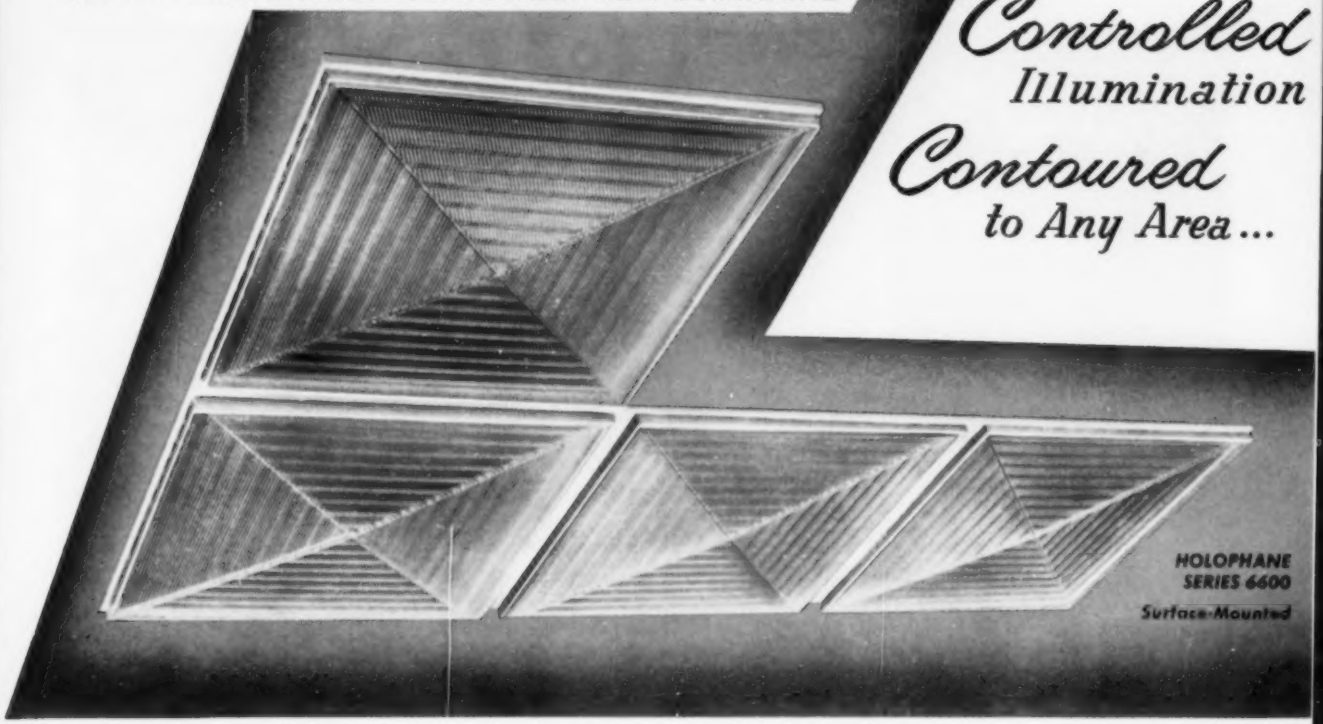
(*News continued on page* 20A)

Conference Story in November IE

Since the October issue was going to press during the IES National Technical Conference, the full report on the St. Louis meeting will be published in November IE. Watch for details of the 1961 IES Conference, including names of national winners in the Applied Lighting Competition, in the next issue.

HOLOPHANE DEVELOPS A TOTALLY NEW LUMINAIRE

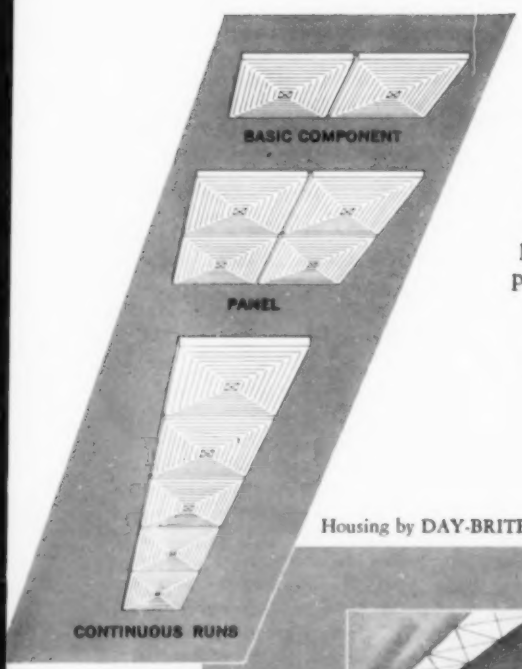
Controlled Illumination Contoured to Any Area...



To meet the critical challenge of the "modular era" Holophane Engineers have developed Series 6600—introducing a distinctive new luminaire and a startling concept that permits almost unlimited flexibility of design.

Using the basic 2 ft. x 4 ft. component, containing acrylic plastic CONTROLENS®, these luminaires can be installed as single units—or aligned for continuous runs—or massed in panels—or tailored to go around corners. Their great versatility satisfies the designer who seeks one luminaire, for all lighting requirements throughout an entire structure.

Add to these, the quality features found in all Holophane lighting products: prismatic control for highest utilization of light, visual comfort, enduring performance, economy in installation and maintenance. Write for data.



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INCOMING Southern California Section chairman, J. Roy Jones (left) receives gavel of office from South Pacific Coast regional vice-president Roy H. Kreyser, while retiring chairman Ed Balogh looks on. Technical highlight of the meeting, the Section's first for 1961-62, was a talk by guest speaker Charles L. Amick, director of research and development, Day-Brite Lighting, Inc., St. Louis, Mo.

(Continued from page 18A)

BOOKS AND PAMPHLETS

A Method for Predicting General Lighting Levels in the Home, available from Westinghouse Lamp Division, Bloomfield, N. J., 20 pp. Single copies free, quantity prices on request.

This booklet offers a convenient summary of the factors involved in the design of residential lighting, from selecting the proper luminaire and charting the light pattern, fixture efficiency and reflectance, to methods of predicting general lighting levels. Worksheets enable the reader to predict average footcandles by the lumen method and estimate the number of fixtures required to produce a desired illumination level.

Reference tables are included for rated initial lumen output of the most popular incandescent and fluorescent sources, rooms indexes, and coefficients of utilization for 40 commonly used types of residential fixtures.

See Your Home in a New Light, available from General Electric Large Lamp Sales Offices, 39 pp., 3 cents per copy.

The fourth edition of this popular home lighting booklet, originally published in 1950, is now available. Theme of the booklet is a series of "recipes" for the installation of lighting for the most common visual activities performed in the home. Type and size of fixtures and lamps, shielding specifications and placement of lighting units for the various tasks are discussed in relation to average eye heights and furniture dimensions. Each lighting "recipe" is illustrated with a drawing showing proper placement of lighting units.

The booklet also includes the most recent recommended footcandle levels for various visual tasks and a general introduction to types of lighting fixtures and the use of diffusers.

Design and Application of Prismatic Street Lighting Refractors, available from Holophane Co., Inc., 342 Madison Ave., New York 17, N. Y., 24 pp.

A well-illustrated guide to prismatic control of street lighting, this booklet covers the fundamentals of design and refractor application data. One section is devoted to line sketches illustrating basic prismatic principles, vertical and lateral distributions, open-bottom-type one-piece refractors, and refractors for fluorescent lamps. The second section includes a complete listing of refractor illustrations, each with its specific basic-type light distribution for filament, vertical and horizontal mercury and fluorescent lamps, ranging from 100-watt vertical mercury to 15,000-lumen filament and 1000-watt horizontal mercury.

Mercury Lighting Technical Guide Book, available from Sylvania Lighting Products, 60 Boston St., Salem, Mass., 45 pp., 25 cents.

Helpful for industrial, commercial, street and other outdoor lighting applications, this guide offers a simple and thorough discussion of mercury lighting. The text covers physical, general and performance characteristics, design, function and types of ballasts, ballast circuitry, economics, maintenance, and trouble-spot detection.

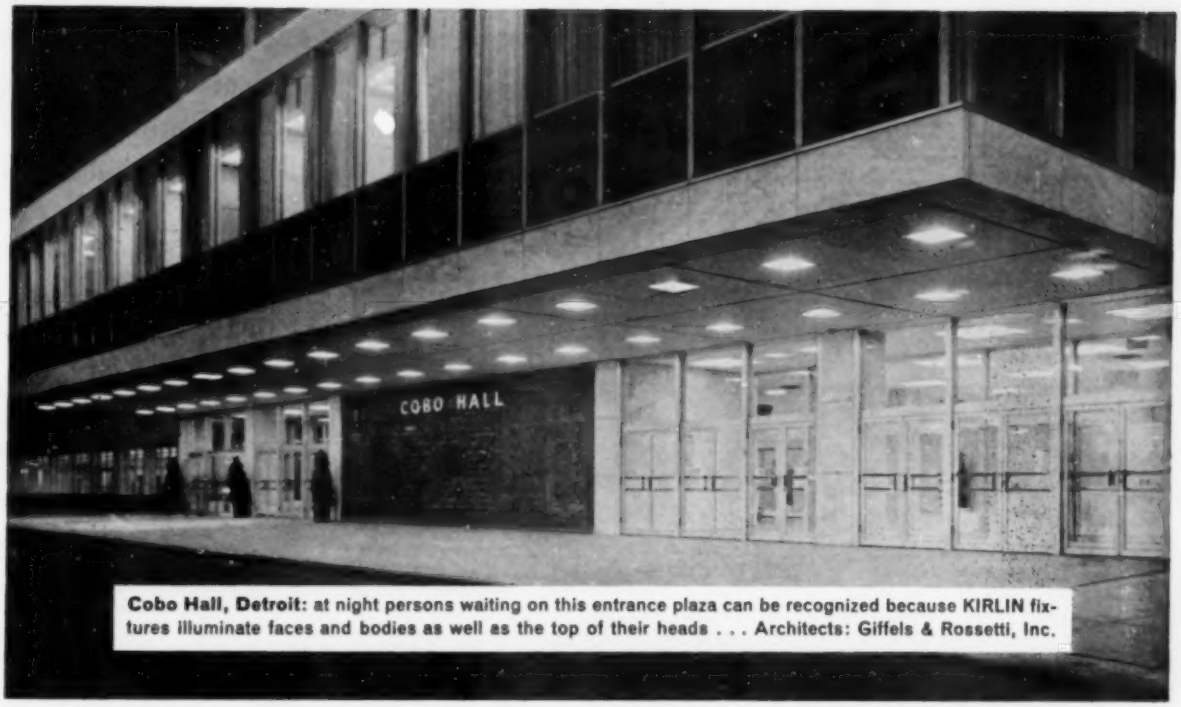
Photos and data on 18 mercury lamp installations, data for 16 typical indoor mercury fixtures, and abundant, clear illustrations accompany the text.

Lighting Systems for Children's Theatres, by James Hull Miller, Bulletin No. 104, available from Hub Electric Co., Inc., 2225 West Grand Ave., Chicago 12, Ill., 16 pp.

Several lighting systems appropriate in size and cost for stages where the playing area is approximately 20 feet are presented in this booklet. Illustrated, detailed analyses of techniques for lighting the actor and the background are presented in clear, nontechnical language.. The booklet also includes discussion of several methods of image projection construction and lighting of portable backgrounds and scrims, and a list of a suggested minimum supply of gelatin and plastic color media for backgrounds, overhead floods, spotlights and projection.

Plexiglas Handbook for Sign Shops, available from Rohm & Haas Co., Plastics Department, Washington Square, Philadelphia 5, Pa., 92 pp.

Detailed technical information on the design, fabrication, lighting, decoration and assembly of acrylic plastic signs, including discussion of several newly developed construction techniques, is contained in this booklet. The chapter on lighting is a comprehensive illustrated presentation of the basic principles of illumination for both panel and letter type signs, supplemented by a section containing data on recommended light sources. Tables of recommended colors, brightness levels, light transmission properties of various plastics, recommendations on sizes, spacing and proportions of letters and a formula for determining the number of lamps and spacing required to achieve desired illumination results are provided.



Cobo Hall, Detroit: at night persons waiting on this entrance plaza can be recognized because KIRLIN fixtures illuminate faces and bodies as well as the top of their heads . . . Architects: Giffels & Rossetti, Inc.

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- **GlasSurfaced† aluminum reflectors.**
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**References to KIRLIN Catalog #79, A.I.A. File #31F2; if it is not in your data files, phone our Sales Engineer in your area.*

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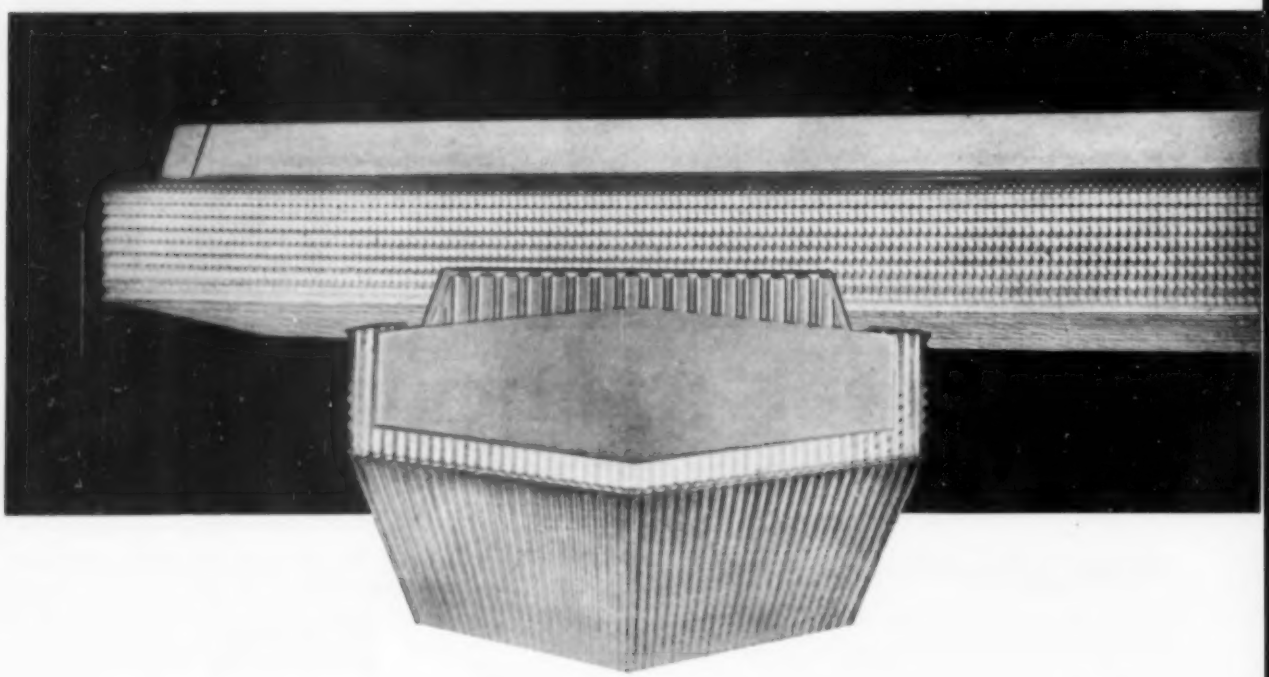
THIS NEW FIXTURE HAS



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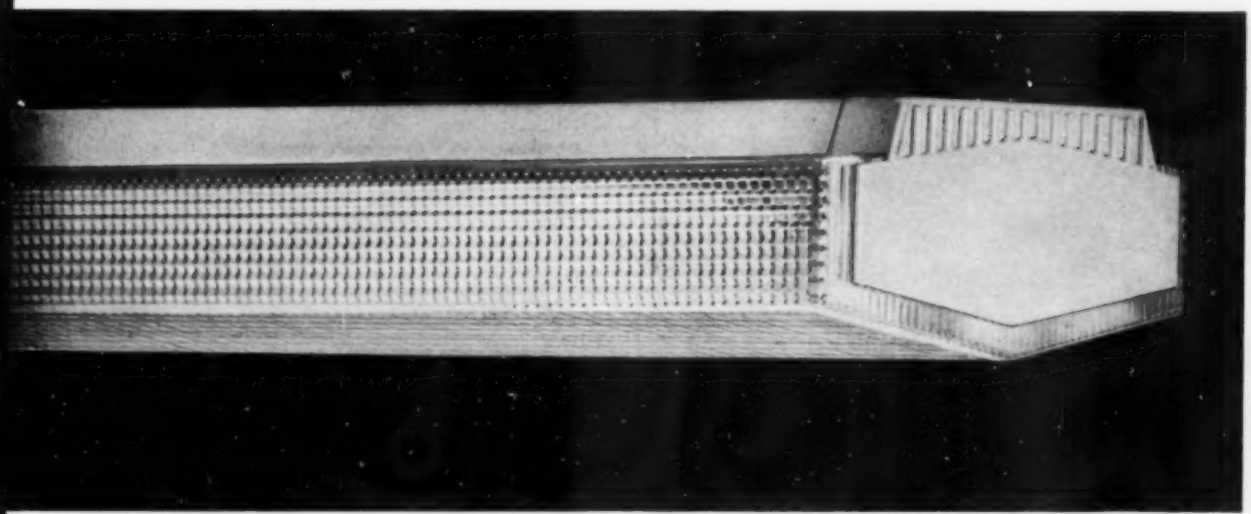

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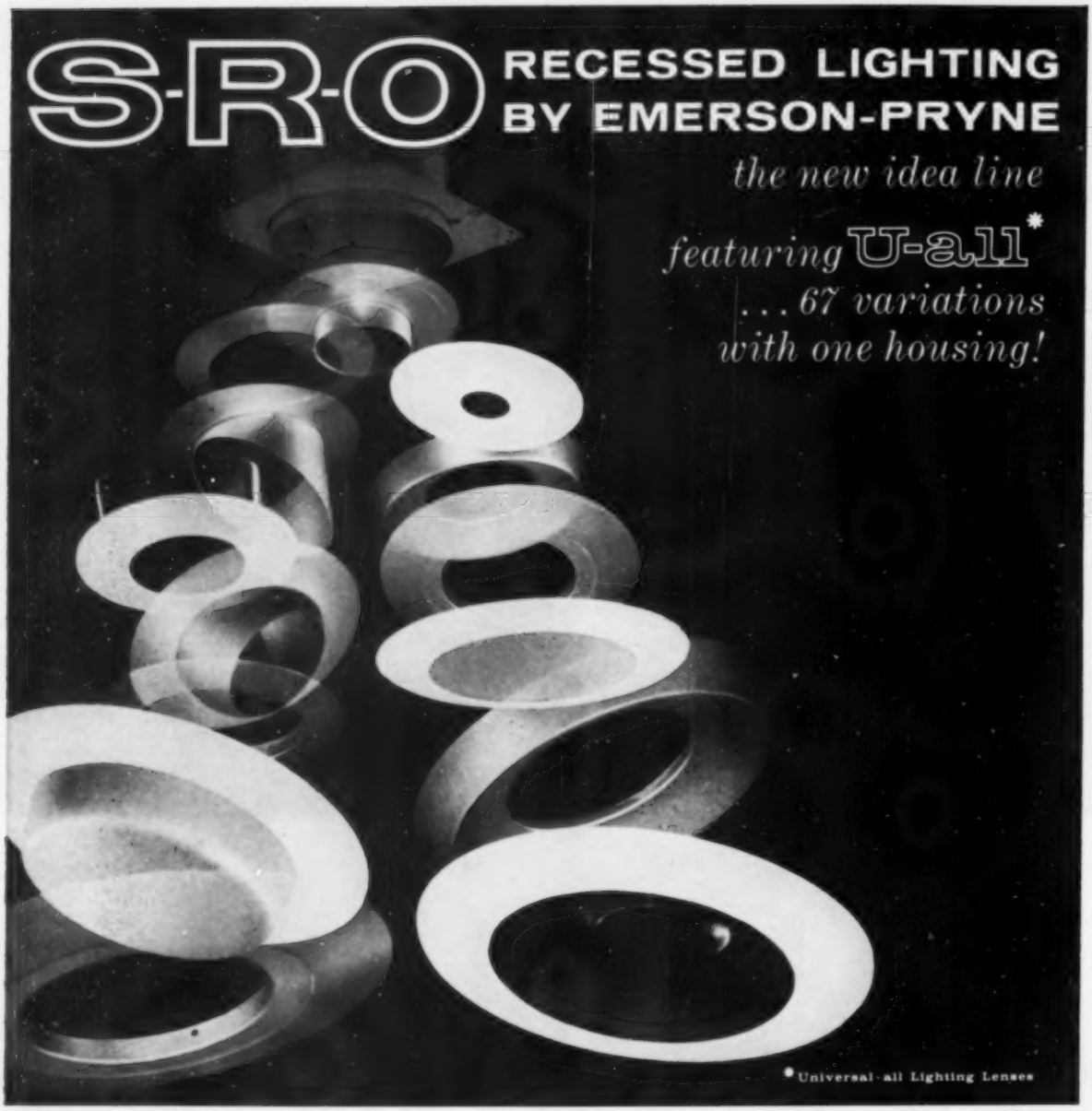

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Secretary—J. SCHREIBER, General Electric Co., 999 98th St., Oakland, Calif.

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Secretary—A. ROSEN, 1053 Garner Ave., Schenectady, N. Y.

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Chairman—J. H. BICHER, General Electric Supply Corp., 1041 Rockland St., Reading 8, Pa.
Secretary—N. C. TRULLSON, 3015 Hillcrest Ave., Oxford Park, Allentown, Pa.

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Secretary—R. YOUNG, 14515 97 Ave., Edmonton, Alta.

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Chairman—VIVIAN HAMILTON, P. O. Box 234, Cloudcroft, N. M.
Secretary—J. H. GLAVY, General Electric Co., 325 Ridgemont, El Paso, Texas.

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Secretary—ELIZABETH S. BYRNES, Tampa Electric Co., P. O. Box 111, Tampa 1, Fla.

Forest City (London) Chapter—Canadian Region
Chairman—O. DUNSMORE, 74 James St., Lambeth, Ont.
Secretary—J. VANDERHEIDEN, 7 Lockyer Place, London, Ont.

Georgia Section—Southeastern Region
Chairman—L. R. BUSH, 26 Peachtree Place, N. W., Atlanta, Ga.
Secretary—W. H. NEWMAN, Box 524, Decatur, Ga.

Golden Gate Section—South Pacific Coast Region
Chairman—A. S. TYLOR, 1037 Cortez Ave., Burlingame, Calif.
Secretary—G. W. SMITH, Smith & Garthorne, 1122 Market, San Francisco 2, Calif.

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Chairman—R. CHAMPAGNE, Electrolier Mfg. Co. Ltd., 202-A Brent Bldg., Regina, Sask.
Secretary—E. BOLTON, Electric Service League, 403 Kerr Bldg., Regina, Sask.

Gulf Coast Chapter—South Central Region
Chairman—J. E. SPRINGER, P. O. Box 1349, Mobile, Ala.
Secretary—SIDNEY W. SNYDER, P. O. Box 1349, Mobile, Ala.

Gulfstream Chapter—Southeastern Region
Chairman—T. C. KENDRICKS, JR., Graybar Electric Co., 845 N.W. Sixth Ave., Fort Lauderdale, Fla.
Secretary—E. Y. EAKER, P. O. Box 8248, Fort Lauderdale, Fla.

(*Continued on page* 26A)

(Continued from page 25A)

Hamilton, Ontario Chapter—Canadian Region
Chairman—J. E. QUIST, Prack & Prack, Architects, 310 Main St. E., Hamilton, Ont.
Secretary—L. GASSON, L. H. Schwindt Co. Ltd., P. O. Box 516, Burlington, Ont.

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Chairman—G. V. DAWSON, H. E. Williams Co., 4838 N. Gladstone St., Kansas City 19, Mo.
Secretary—D. J. STEWART, Evans Electrical Construction Co., 734 Armstrong, Kansas City, Kans.

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Chairman—RUSSELL W. BENJAMIN, JR., 1115 Broad St., Bridgeport, Conn.
Secretary—JOHN C. GAGE, JR., P. O. Box 700, Norwalk, Conn.

Illini Chapter—Midwest Region
Chairman—W. J. MARQUARDT, 908 South 23rd St., Springfield, Ill.
Secretary—C. J. EGAN, Illinois Power Co., 500 S. 27th St., Decatur, Ill.

Indiana Section—North Central Region
Chairman—N. SCHNITKER, Indianapolis Power & Light Co., 25 Monument Circle, Indianapolis, Ind.
Secretary—B. R. BOYLAN, General Electric Lamp Division, 3333 N. Meridian St., P. O. Box 88072, Indianapolis 8, Ind.

Inland Empire Chapter—Pacific Northwest Region
Chairman—RAY D. ROOKEY, Washington Power Co., W. 825 Trent, Spokane, Wash.
Secretary—ROBERT L. PATRICK, Thomas Industries, 4027 N. Elgin, Spokane, Wash.

Iowa Section—Midwest Region
Chairman—A. OJA, George C. Mittauer & Associates, 1407 Memorial Drive, Cedar Rapids, Ia.
Secretary—E. H. FORD, Iowa Electric Light & Power Co., Box 351, Cedar Rapids, Ia.

Kentuckiana Chapter—Great Lakes Region
To be announced.

Maritime Chapter—Canadian Region
Chairman—T. E. WALLACE, New Brunswick Electric Power Commission, King St., Fredericton, N. B.
Secretary—HAYWARD GRANT, New Brunswick Electric Power Commission, King St., Fredericton, N. B.

Maryland Section—East Central Region
Chairman—J. C. BURDETTE, Egli & Gompf, Inc., 1003 N. Calvert St., Baltimore 2, Md.
Secretary—C. L. BURESS, Douty & Downie, 2323 Maryland Ave., Baltimore 18, Md.

Mexico Chapter—Non Region
To be announced.

Miami Valley Section—Great Lakes Region
Chairman—S. L. BURNHAM, General Electric Co., 225 N. Wilkinson St., Dayton 2, Ohio.
Secretary—A. M. LAFFERTY, JR., Stein Electric Co., 1219 East Third St., Dayton 2, Ohio.

Michigan Section—Great Lakes Region
Chairman—DR. W. A. HEDRICH, University of Michigan, Ann Arbor, Mich.
Secretary—G. THORNTON, S. P. Ecclestone & Sons, Inc., 18989 James Couzens Highway, Detroit 35, Mich.

Mid-South Chapter—South Central Region
Chairman—CHARLES D. HOOPER, Memphis Light, Gas & Water Division, P. O. Box 388, Memphis, Tenn.
Secretary—ROBERT J. MERRITT, 130 N. Greer, Memphis, Tenn.

Milwaukee Section—North Central Region
Chairman—C. KNOERR, Knoerr & Fischer, Inc., 1015 N. Milwaukee St., Milwaukee 2, Wis.
Secretary—W. SCHUMAKER, Northern Light Co., 1661 N. Water St., Milwaukee, Wis.

Mississippi Chapter—South Central Region
Chairman—STEPHEN H. TURNER, Mississippi Power & Light Co., 144 S. Congress, Jackson, Miss.
Secretary—JOHN A. CLARK, Stuart C. Irby Co., 815 South State St., Jackson, Miss.

Montreal Section—Canadian Region
Chairman—W. G. MOORE, Electrolier Mfg. Co. Ltd., 5849 Boyer St., Montreal, Que.
Secretary—W. J. MCCORMICK, Sylvania Electric (Canada) Ltd., 6233 Cote de Liesse Rd., Montreal 9, Que.

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Chairman—L. VAN NOSTRAND, 1400 N. St., Sacramento, Calif.
Secretary—G. W. BURKE, JR., 1651 Parkmead Way, Sacramento 22, Calif.

New England Section—Northeastern Region
Chairman—J. E. CARR, General Electric Co., 140 Federal St., Boston, Mass.
Secretary—R. J. EDDY, Sylvania Electric Products Inc., 60 Boston St., Salem, Mass.

New Jersey Section—Northeastern Region
Chairman—M. H. SILVERMAN, Fluores-O-Lite Co., Evans Terminal, Hillside, N. J.
Secretary—R. B. COLE, JR., Jersey Central Power & Light Co., Madison Ave. At Punch Bowl Rd., Morristown, N. J.

New Mexico Chapter—Inter-Mountain Region
To be announced.

New Orleans Section—South Central Region
Chairman—J. A. STELLY, Gulf States Utilities Co., Box 2431, Baton Rouge, La.
Secretary—V. L. GOODMAN, L. N. Goodman & Associates, 405 Audubon Bldg., New Orleans, La.

New York Section—Northeastern Region
Chairman—R. G. WILLIAMS, 71 Birch Lane, Bar Harbour, Massapequa, N. Y.
Secretary—E. O. KASSMAN, Westinghouse Electric Corp., 40 Wall St., New York, N. Y.

(Continued on page 44A)

1962 IES Regional Conferences

Region	Date and Place	Chairman
East Central	April 9-10 Traylor Hotel Allentown, Pa.	P. H. Hildebrand Pennsylvania Power & Light Co. 9th & Hamilton Sts. Allentown, Pa.
Southeastern/ South Central	April 12-13 King Edwards Hotel Jackson, Miss.	B. M. Davis Mississippi Power & Light Co. Jackson, Miss.
Great Lakes	April 16-17 Dayton Biltmore Hotel Dayton, Ohio.	Ivar Holmer Dayton Power & Light Co. 25 N. Main St. Dayton, Ohio.
Midwest/ North Central	May 10-11 Radisson Hotel Minneapolis, Minn.	Harry Spell Northern States Power Co. 15 S. 5th St. Minneapolis, Minn.
Canadian	May 14-15 Winnipeg, Man.	V. Stuart Buckler Green, Blankstein, Russell & Associates 222 Osborne North Winnipeg, Man.
Pacific Northwest	May 17-18 Davenport Hotel Spokane, Wash.	Ray Rookey Washington Water & Power Co. W. 825 Trent Spokane, Wash. Ted W. Beadle P. O. Box 1445 Spokane, Wash.
South Pacific Coast	May 21-22 U. S. Grant Hotel San Diego, Calif.	Alan J. McCutcheon, Jr. San Diego Gas & Electric Co. 861 6th Ave. San Diego, Calif. Ralph Rohrbach Pacific Wholesale Electric Co. 711 Union San Diego, Calif.
Inter-Mountain	May 24-25 Western Skies Hotel Albuquerque, N. M.	Albert W. Boehning, Jr. 1843 Lomas Blvd., N. E. Albuquerque, N. M. Stanley D. Johnston General Electric Co. 9646 Towner N. E. Albuquerque, N. M.
Northeastern	June 11-12 Hotel U. S. Thayer West Point, N. Y.	G. G. Rae Holophane Co. Inc. 342 Madison Ave. New York 17, N. Y.

Glass for lighting

CORNING'S ANSWERS TO A FEW LIGHTING PROBLEMS

PYREX® TUBES PROTECT TUNNEL LAMPS

A number of the traffic tunnels in this and other countries are now protecting their fluorescent lighting with a special PYREX brand glass tube.

The glass tube, with its smooth, hard surface, protects lamps and electrical connections from the detergents commonly used to clean these tunnels.

In most of these installations two fluorescent lamps are placed end to end in a tube in the maintenance shop. The maintenance crew take a load of these tubes down into the tunnels and replace burned-out lamps in a fraction of the time formerly needed. It takes just seconds to remove one tube and insert a fresh one.

Can we help you simplify your lighting requirements with glass by Corning?

4000°K LIGHT WITH ONLY 2°C HEAT RISE

We make a clear glass reflector which can be coated to correct the light from an incandescent lamp to make it equivalent approximately to the light from a 4000°K source.

The coated unit reflects visible light, but lets the infrared pass right through. The resulting light is so cool, it causes only negligible heating.

This particular reflector is for a dentist's lamp. It provides a narrow band of light of unusually uniform intensity while keeping both patient and dentist cool.

The reflector in this application is curved and has twenty-eight distinct optical sections. Each of the twenty-eight reflects light across the entire work area, so the dentist gets uniform lighting despite his hand and instrument movements.

If you would like to delve further into color-correcting, infrared-blocking reflectors and filters, check the coupon.

WE MAKE THE LENS FOR THE "BRUTE"

This is the largest lens used in movie set lighting. It's a full twenty-four inches across. The lamp it fits on won an Academy Award for its maker, Mole-Richardson.

Figure the expanse of the lens and the heat generated by a carbon arc when you feed it 225 amperes, and you'll appreciate the fact that only a PYREX brand glass would do the job at reasonable cost.

It's not really surprising that we can make such a monster, although it takes special equipment to make the "Brute."

Quality is a must! We put each and every lens of this type we make on a photometer to make sure it delivers the actual candle power you specify in the pattern you want.

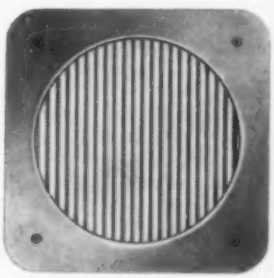
We can colouver the risers of our lenses to reduce brightness in your glare zones.

We can match these lenses with a full range of color filters.

We can put an infrared reflecting coating on them to take the heat out of your light.

Try us the next time you have a lighting problem, big or small, simple or complex.

LIGHTING SWIMMING POOLS IS NO PROBLEM



When you want light in a wet environment, PYREX brand glasses recommend themselves almost automatically.

Here are glasses which can take the corrosive influence of water and chlorine and the like without pitting or clouding or wearing away.

Here are glasses that can take the thermal shock of a 1500 watt lamp lit suddenly on a crisp spring evening.

Here are glasses that take hard knocks.

Here are glasses whose secrets we know well, so we can manufacture a new item in mass quantities quickly at a pleasing price.

Perhaps these are the reasons so many of our swimming pools are lit with the help of PYREX brand glasses.

If you are in this market, we would like to demonstrate our capabilities not only in the manufacturing area but in such allied fields as optical design, colors, etc.

CORNING MEANS RESEARCH IN GLASS

CORNING GLASS WORKS, 6110 Crystal Street, Corning, N.Y.

Please send more information on:

- ☐ Fluorescent lamp tubes
- ☐ Color-correcting reflectors
- ☐ Lenses
- ☐ Swimming pool lenses

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

Only new Lumi-Flo air handling Troffers offer all these advantages

Benjamin has forged far ahead of the field with this latest advance in combination lighting and air handling fixtures.

These improvements are basic; it is to your advantage to give yourself the security of a thorough investigation before a final decision is made.

CLEAN CEILINGS WITH COMPLETE FLEXIBILITY

With Lumi-Flo you can be assured of ceilings which are esthetically clean without any visible ceiling obstructions. All you see is an attractive, well illuminated ceiling. With the new Benjamin Triple-Shell Lumi-Flo, you can light, cool, heat and ventilate interior areas through the same concealed troffer. When it comes to flexibility, Lumi-Flo can't be topped—you can design your building so that every 25 or 250 sq. ft. of floor area has its own air conditioning and ventilating. Better yet, when your requirements vary, you can have both in the same installation.

OFFERS MAXIMUM LIGHT EFFICIENCY

With Triple-Shell Lumi-Flo, the air supply is separated from the lamp chamber by an insulating air gap. Used on cooling or heating cycle, Triple-Shell construction permits heat dissipation to the plenum, yet prevents lamp chamber from over-cooling (which causes "pink-light") or over-heating (which reduces lamp efficiency).

Lumi-Flo offers the highest average operating efficiency possible through the normal cooling and heating ranges.

Lamp flicker and color variation caused by over-cooling are things of the past with Triple-Shell Lumi-Flo.

AN AIR CAPACITY TO MEET EVERY JOB CONDITION

With Triple-Shell Lumi-Flo, you can meet the exact requirements of any job, large or small. Two types of dampers engineered by Tuttle & Bailey give air-handling capacities from zero to over 200 CFM and combine with two basic air patterns to offer the best possible combination of capacity and distribution for your specific application.

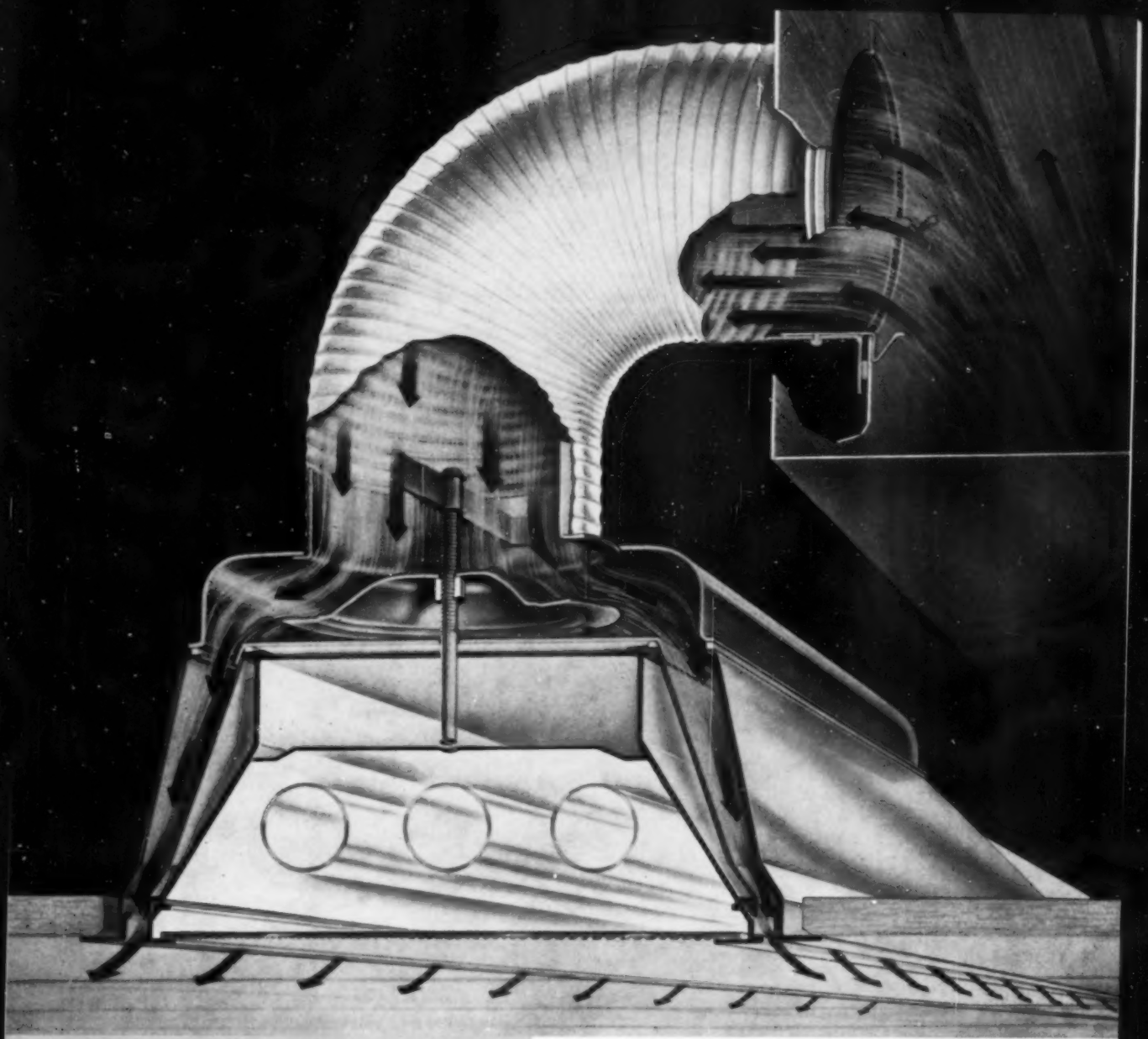
FASTER, MORE ECONOMICAL INSTALLATION

No cumbersome yokes—a swivel bar hanging device cuts installation time as much as 50%. Damper installation is simple and quick—one snap and a special locking device makes the damper a permanent part of the troffer. Special neoprene gasketing eliminates the possibility of air leaks.

DAMPERS ARE QUIET, EASILY ADJUSTABLE

Dampers are engineered by Tuttle & Bailey for quiet operation at all capacities. The dampers adjust quickly, easily—give precise adjustment over wide pressure ranges. Balancing is simplified.

Lumi-Flo is the only complete line listed by Underwriters' Laboratories for lighting, cooling and heating.



▲ Here is a cutaway view of the new Benjamin Triple-Shell Lumi-Flo troffer. See how the damper diffuses the air and directs it evenly to air manifolds on both sides of the troffer. Note also how the lamp chamber is separated from the air passageway at top and sides by an insulating air gap. This lets lamps operate at near their optimum design temperature—unaffected by the cooling or heating air flow.

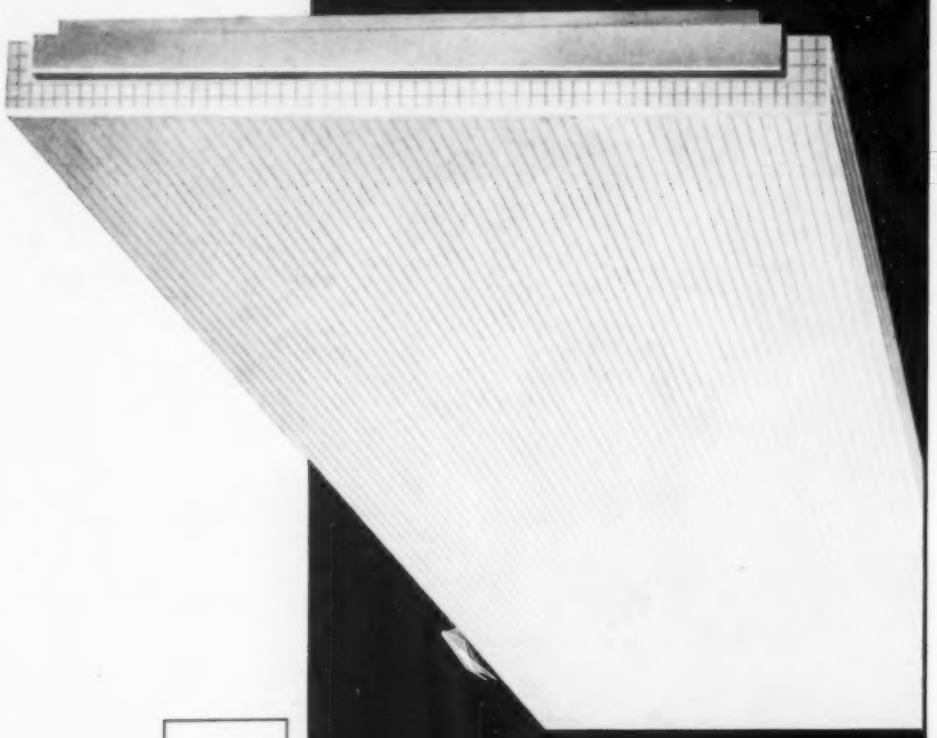
◀ Here's what Triple-Shell Lumi-Flo troffers do for ceilings. The integrated lighting and air conditioning system is totally compatible in function and appearance with the handsome architecture of the Illinois Agricultural Building at Bloomington, Illinois.

Write today for new, 40 page Lumi-Flo Catalog

The most complete manual on Air-Handling Troffers ever compiled.

BENJAMIN DIVISION
THOMAS INDUSTRIES Inc.
207 EAST BROADWAY
LOUISVILLE 2, KENTUCKY

Air Handling components by Tuttle & Bailey Division of Allied Thermal Corporation, New Britain, Connecticut.



Domino luminaires — new beauty and versatility in lighting. Totally lens enclosed, with an apparent depth of only 1½". Installs easily as a unit or in rows, for a free-flowing unbroken line of shadowless, non-glaring light. Easy to relamp. In acrylic or styrene, 2 or 4 Rapid-Start lamps. See your Smithcraft representative, or write for details: SMITHCRAFT CORPORATION • CHELSEA 50, MASSACHUSETTS

Smithcraft

DOMINO!

NEW EQUIPMENT DATA

AVAILABLE FREE WITH RETURN CARD

New manufacturers' catalogs and bulletins listed below are available to IE readers who return card below. Clip out card, circle numbers wanted, print name and address plainly, affix 3-cent stamp and mail. Request will be forwarded promptly to manufacturer.

(1) BALLASTS New series of four bulletins has 20 pages describing outdoor lighting transformers for mercury-vapor and incandescent and their applications; includes brochures on 100 to 1000-watt mercury lamp transformers; contains complete wiring diagrams, other specifications for both constant wattage and series circuit types. Jefferson Electric Co., Bellwood, Ill.

(2) OUTDOOR UNITS Eight-page pamphlet shows solutions to problems frequently met in external lighting of industrial, commercial, decorative, protective and sports lighting installations; pictured in full color. Wide-Lite Corp., Houston, Texas.

(3) AIR-HANDLING FIXTURES Company periodical "Day-Briter" for July pictures and describes several lighting installations of various types where their line of air-handling fluorescent fixtures are used, describes properties of this type of unit. Day-Brite Lighting Inc., St. Louis, Mo.

(4) RESIDENCE FIXTURES 60-page Catalog 105 shows company's complete line of installed luminaires for home lighting, color-printed throughout; includes indoor and outdoor units, both incandescent and fluorescent. Progress Mfg. Co. Inc., Philadelphia, Pa.

(5) BALLASTS Eight-page catalog of fluorescent lamp ballasts for sign, flashing, and weatherproof applications gives catalog numbers and equivalents and includes electrical, physical characteristics plus installation features and specifications; UL regulations and performance recommendations. Universal Mfg. Corp., Paterson, N. J.

(6) METAL FRAMING Bulletin 222 tells how two TV stations used company's metal framing to hang or support electrical and electronic equipment, including unique methods of installing heavy monitors, lighting and transformers with two separate methods for supporting studio lights. Unistrut Products Co., Chicago, Ill.

(7) SPORTS FLOODLIGHT New four-page bulletin and supplement describe "Sportoflood," heavy-duty floodlight for sports and other outdoor lighting; contains complete specifications, photometric data, and installation information; describes special features. Appleton Electric Co., Chicago, Ill.

(8) FLUORESCENT LUMINAIRE Six-page, two-color folder shows company's "Crystalux" series of shallow commercial fluorescent units, gives specifications, E.T.L. photometric reports and installation information. American Lighting Corp., Hackensack, N. J.

(9) HIGH-BAY FIXTURES Bulletin H covers complete range of high-bay units, including 18" diameter aluminum or porcelain units for 400-watt mercury-vapor lamps up to 24" diameter for 1500-watt incandescent; provides construction details and specifications and defines some basic considerations for industrial lighting. Benjamin Div., Thomas Industries, Louisville, Ky.

(10) RESIDENCE LUMINAIRES 72-page full-color catalog displays complete range of fixtures for home and public area lighting, includes 250 styles in European and Early American as well as contemporary designs. Globe Lighting Products Inc., Brooklyn, N. Y.

(11) SHALLOW FLUORESCENT Bulletin V661 covers shallow "Vega" series of commercial fluorescent luminaires for surface or pendant mounting, with four styles of diffusers; gives photometric, specification and dimension data, including light distribution curves. Metalcraft Products Co. Inc., Philadelphia, Pa.

(12) PORTABLE LIGHTING Four-page catalog covers line of portable, adjustable table and floor lamps for supplementary lighting, both incandescent and fluorescent, with special "Ultra-Flex" arms and magnifiers for assembly and close inspection. O. C. White Co. Worcester, Mass.

(13) COMMERCIAL FLUORESCENT Ten-page booklet B-8235 describes "Mark II Mainliner" line of commercial recessed fluorescent luminaires, furnishes some construction details and suggested applications, and shows various plastic and glass shielding available. Westinghouse Electric Corp., Cleveland, Ohio.

(14) QUARTZ FLOODLIGHT Four-page two-color bulletin gives full details on "Quartalite 1500" floodlight for a wide variety of outdoor and indoor applications, describes construction and beam-spread features and provides full photometric data; supplement lists parts and prices. Appleton Electric Co., Chicago, Ill.

(See next page)

Offer good for two months only

Circle numbers wanted. Print name and address plainly. Affix 3-cent stamp and mail.

10-61

To ILLUMINATING ENGINEERING

Please have sent to me at address below, without further obligation, items circled below:

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27									

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

Not good after December 31, 1961

(15) FLUORESCENT/INCANDESCENT UNITS Colorful 12-page brochure illustrates some of the fluorescent and incandescent luminaires produced for architectural application; gives full specifications and optional features of recessed downlites, fluorescent troffers and surface and pendant mounted units of various types. Gotham Lighting Corp., Long Island City, N. Y.

(16) SCHOOL SPORTS LIGHTING Four-page two-color bulletin shows mercury-vapor and incandescent fixtures in indoor gymnasium applications, gives construction details and photometric data, and discusses a wide variety of considerations with reference to gymnasium installations, includes light distribution curves etc. Holophane Co. Inc., New York, N. Y.

(17) HOME LIGHTING Four-color, 60-page catalog "The Light Idea" depicts 15 different lighting fixture groupings for residences, both indoor and outdoor, creating specific lighting environments and including luminous ceilings, pendants, spots and floods, as well as garden and driveway lights. Virden Lighting, Cleveland, Ohio.

(18) SERVICE STATION FIXTURES New bulletin page shows "Trim Line" series of outdoor fluorescent luminaires using four or six ultra high output lamps and recommended for service stations, parking lots, storage yards and other applications; shows specifications and construction features as well as catalog numbers and complete dimensions. Guardian Light Co., Oak Park, Ill.

(19) POLES AND STANDARDS New durable ring-binder contains seven different catalogs covering poles and standards for street, highways and area lighting, signals and signs, as well as a wide variety of other purposes; tells of materials available and gives full specifications for each type. Kerrigan Iron Works, Nashville, Tenn.

(20) LAMP CATALOG New 16-page, two-color catalog gives details of company's complete line of lamps recommended for industrial areas, including mercury and incandescent reflector types and others, as well as infra-red, spatter-proof, weatherproof types, etc., and specifications. Radiant Lamp Corp. Newark, N. J.

(21) EMERGENCY LIGHTING 24-page booklet illustrates and gives details of new 32-volt emergency lighting systems for stand-by use, explains special features of battery operation and shows new line of exit signs, application information and typical job specifications. Standard Electric Time Co., Springfield, Mass.

(22) PLASTIC LENS PANELS New comprehensive plastics lighting catalog shows company's line of diffusers and lens panels, illustrating each and providing photometric charts and graphs; includes new K-4 and K-5 series of white opal polystyrene and acrylic prismatic lens panels. K-S-H Plastics, Inc., St. Louis, Mo.

(23) EXTERIOR FIXTURES New four-page, two-color folder shows exterior cast aluminum lighting units of five basic types suggested for outdoor installation on apartment buildings as well as police and fire stations and other public buildings; available in various lengths with fluted curved glass panel, aluminum piano hinged door; gives complete specifications. Gruber Brothers Inc., Brooklyn, N. Y.

(24) FOOTBALL FLOODLIGHTS New manual contains 32 pages, provides specific lighting recommendations for football fields, including mounting heights, type and installation of poles, type and number of floodlights required for specific seating capacities as well as a complete material list for each type of field; gives details on "Olympia" line of floodlights for all purposes. Benjamin Div., Thomas Industries Inc., Louisville, Ky.

(25) RESIDENCE LUMINAIRES New 96-page lighting fixture catalog follows format of decorator magazines showing room settings rather than lists of fixtures, but features 450 styles of installed fixtures, 200 said to be new designs. Lightolier, New York, N. Y.

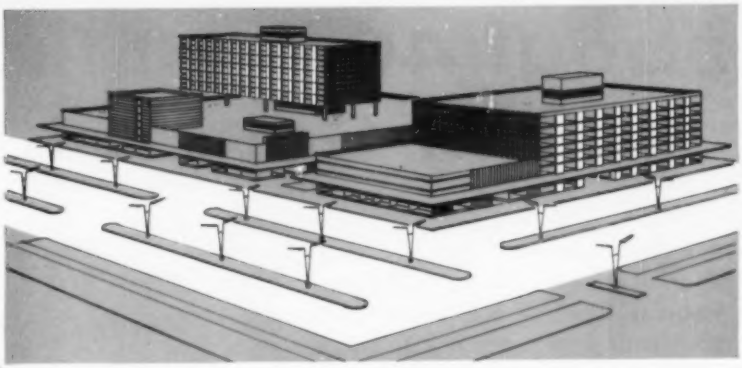
(26) COMPACT TROFFER New four-page bulletin TE 761 gives details "Aurora" line of minimum depth troffers, recommended for office and other commercial installations, available with four standard diffusers; gives photometric, specification and dimension data and shows typical installations. Metalcraft Products Co. Inc., Philadelphia, Pa.

(27) BALLAST BUYER'S GUIDE New 16-page, two-color guide publishes full details on complete line of fluorescent lamp ballasts for wide variety of applications; includes handy alphabetical listing with reference to tables of specifications for each type; shows wiring diagrams and other description. Advance Transformer Co., Chicago, Ill.

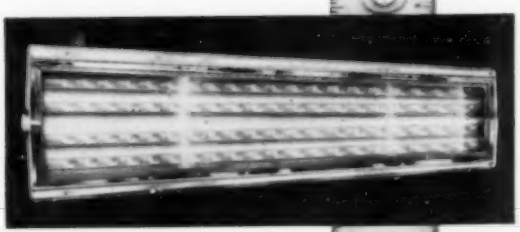
PLACE 3¢ STAMP HERE

ILLUMINATING ENGINEERING SOCIETY
United Engineering Center
345 East 47th St.
New York 17, N. Y.

These items describe valuable new literature about a wide choice of lighting equipment and services. The already addressed return card is something new to make it easier for IE readers to request the information. Use this service to bring your lighting equipment file up to date.



plaza lite modern in every concept...



SPAULDING brings you the VEGAS . . . the one and only tapered fluorescent fixture that will complement any shopping center parking area large or small.

- From the J. H. SPAULDING COMPANY fluorescent floodlighting that is architecturally compatible with today's contemporary center designs . . . modern in every concept, here's why:
- LOW INITIAL COST . . . no more expensive than mercury vapor and adapts to 480 volt systems.
- SUPERIOR COLOR RENDITION . . . not the weak ghostly blue of mercury vapor.
- POWER SAVING . . . 72 lumens per watt compared to 54 lumens per watt for mercury vapor means twenty dollars per year savings in energy costs.
- STRENGTH . . . PLAZA LITES withstand 75 mph winds with a safety factor of 2.0.
- NEW AND DIFFERENT . . . at last the opportunity to give your center the look of distinction.

J.H. Spaulding COMPANY | 3731 DIRR STREET, CINCINNATI 23, OHIO
DESIGNERS OF AMERICA'S MOST DISTINCTIVE OUTDOOR LIGHTING

Here's money-saving news about 40-watt fluorescents from General Electric

It's the brightest 40-watt cool white fluorescent ever made. With the General Electric NEW F40 you give your customers a 7% bonus in light at *no extra cost.* This extra light is worth 15¢ to 30¢ to most users. Yet the price of this lamp is the same as for ordinary fluorescents that give less light.

Now you can increase present lighting levels without charging a customer a single extra penny for lamps, fixtures or electricity. If you're putting in a new installation, you can give him the light level he wants with fewer lamps and fixtures.

General Electric scores another first in offering your customers this bonus in standard 40-watt "white" fluorescent lamps. The G-E NEW F40 is rated at 3100 lumens in popular cool white, 3250 in white or warm white. That's because of three light-producing G-E Premium 3 construction features available for the first time in a lamp that sells for the same price as ordinary fluorescents—only $1.30 for cool white, $1.35 for other "white" colors:

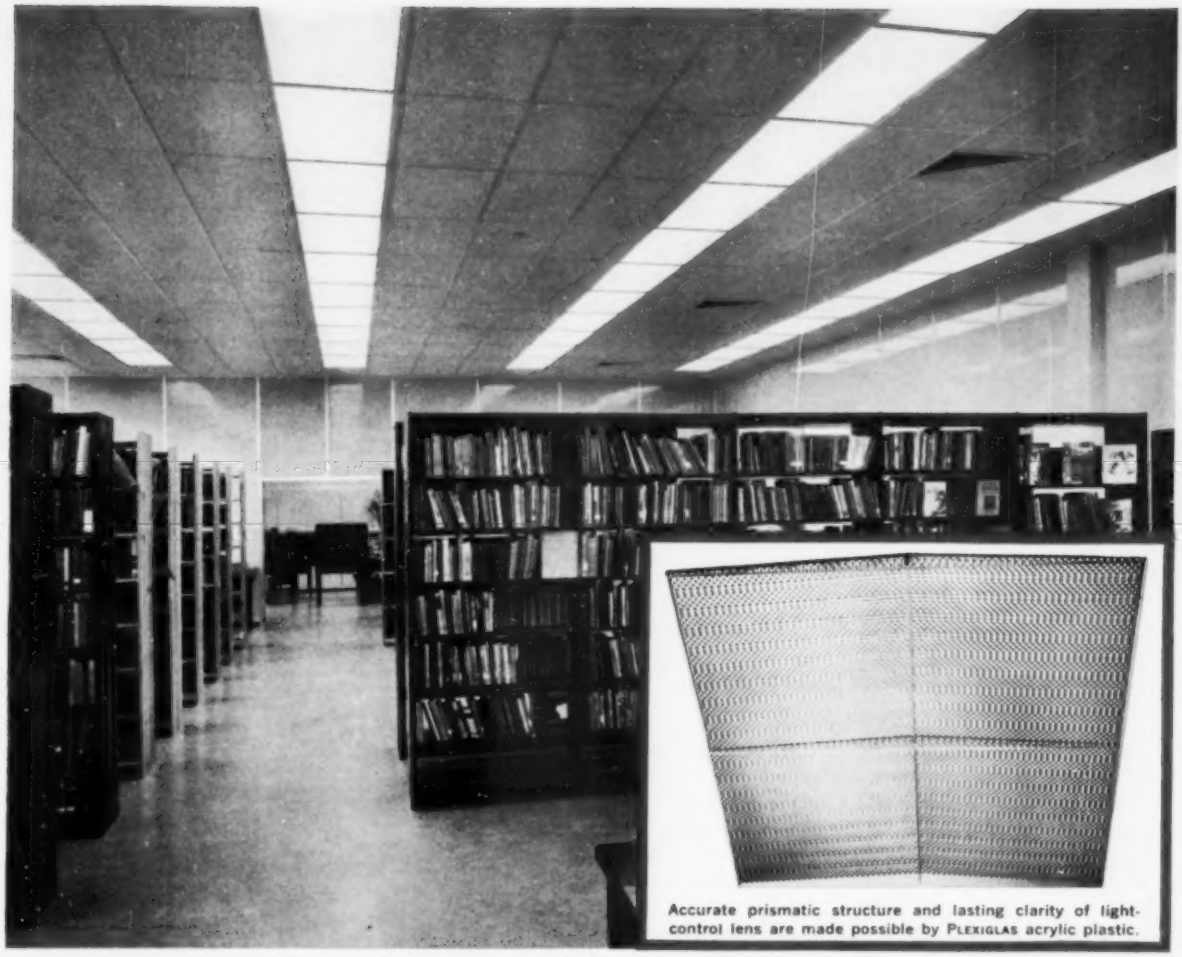
1. G-E wattage-miser electrode helps convert power ordinarily lost in the cathode into useful light—free.
2. New, more efficient gas mixture.
3. New electronically screened bonus-phosphor.

NEW F40 is rated at 7500 hours in Rapid Start and starter-type circuits (6000 in systems installed before 1954). In pre-'54 circuits use F40/54 lamps. They give 7500-hour life, same light as ordinary 40-watt fluorescents (2900 lumens) at the same price ($1.30 cool white). General Electric Co., Large Lamp Dept. C-123, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW F40
ONLY $1.30 LIST



Accurate prismatic structure and lasting clarity of light-control lens are made possible by PLEXIGLAS acrylic plastic.

Control lenses molded of PLEXIGLAS mounted in continuous rows in library of County of Sonoma school administration building, Santa Rosa, California. Architects: Steel & Van Dyke, Santa Rosa.

Plexiglas...for lighting that stands out and stands up

When lighting equipment includes control lenses molded of PLEXIGLAS® acrylic plastic, the result is illumination of the highest quality. This is because PLEXIGLAS makes possible a precisely designed optical element that directs light to the area where it is required and, at the same time, minimizes the surface brightness of the lens as seen from normal viewing angles.

In addition, lenses of PLEXIGLAS remain free of discoloration even after years of exposure to fluorescent light. They are strong and rigid yet light in weight, resulting in safety overhead and ease of maintenance. And the crystal clarity of PLEXIGLAS assures full utilization of light.

Full details on the use of PLEXIGLAS as a lighting material are contained in our 40-page technical bulletin "PLEXIGLAS for Lighting". We will be glad to send you a copy.

ROHM & HAAS

PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Co. of Canada, Ltd., West Hill, Ontario*

PLEXIGLAS

Efficient methods mean orderly, accurate assembly. Here, overhead conveyor moves luminaires in our spacious plant.

Manufacture of hinged poles — these and other products flow quickly through production system for on-time delivery.

What makes Revere the consultant's choice for outdoor lighting?

Revere builds lighting equipment to outlast even the user's expectations

How long do your clients expect their outdoor lighting equipment to last? *Most* users expect the equipment they invest in to last at least as long as the application. It seldom does. Realistic consulting electrical engineers know that in outdoor lighting, as in most other things, you get exactly what you pay for in terms of engineered light output and in equipment durability.

Revere people know this too. That's why it's company policy to build up to a quality level, never down to a price level. The slight price premium sometimes commanded by Revere products is invested by the factory in manufacturing and design refinements which assure a generous return in terms of premium performance and durability. The result is reliability you don't often see, and added years of service you don't usually expect.

Just as the lighting specifier can select exactly the right equipment for any application from Revere's wide line, so can Revere utilize all the resources of a large, modern plant to select the best manufactvring method for each product. When you specify Revere your clients get all the light they're paying for, delivered where they want it, in fixtures designed and made to outlast even the user's expectations.

Write for your copy of Revere's comprehensive outdoor lighting catalog. Or see your Revere sales engineer for prompt answers to your questions on how our standard line or custom design service can serve your needs.

Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (In suburban Niles)
Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles

Components such as this spun aluminum reflector are carefully fabricated to exceed application requirements.

Electrostatic spray painting produces a smooth, consistent, long-lasting prime coat on Revere poles and sub-assemblies.

An important part of Revere's service is the custom design and production of any special equipment needed for the job.

Introducing a magnificent NEW line of industrial lighting fixtures from Sylvania . . .

The

Power-V

Series

Today you can specify or purchase a wide variety of industrial lighting fixtures at varying prices. Many of these fixtures have particular features that make them advantageous to use in specific applications.

But now from Sylvania comes a complete and versatile line of NEW industrial fixtures . . . a series that includes all of the features you normally look for in a fixture plus outstanding quality points all its own.

THIS IS SYLVANIA'S POWER-V SERIES

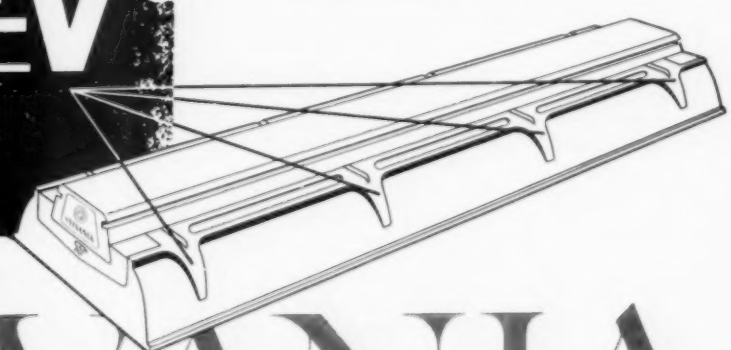
A ruggedly-built series that shrugs off accidental abuse . . . that features a new concept of design providing a wider and deeper embossed reflector for better lighting yet maintaining a low silhouette for handsome appearance.

Power-V units are designed to meet RLM specs and can handle all types of the powerful 1500 ma extra-high output lamps.

The Power-V Series is simple to install . . . easy to maintain . . . provides long, trouble-free service . . . yet is modest in cost.

If you have any interest in industrial lighting, you should learn about Sylvania's Power-V Series. For additional information, write to:

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
One 48th Street, Wheeling, West Virginia



LIGHTING FIXTURES BY

SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

the beauty of wood brought to light...

by NEO-RAY WOOD-BEAM CEILING

MODULAR SUSPENSION SYSTEMS

LUMINOUS . . . INTEGRATED . . . ACOUSTIC

2' x 2', 2' x 4', 4' x 4' Modules

2 Ft., 3 Ft., 4 Ft. Parallel Beams

WOOD-BEAM 4'x4' FIXTURES

SURFACE . . . RECESSED . . . PENDANT

One fixture for all installations. Designed for individual mounting, or in any pattern . . . furnished for six 48" rapid start lamps, any 2' x 2' diffuser.

Write for FREE Brochures, Lighting Details, Budget Estimate, and Samples

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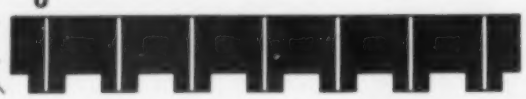
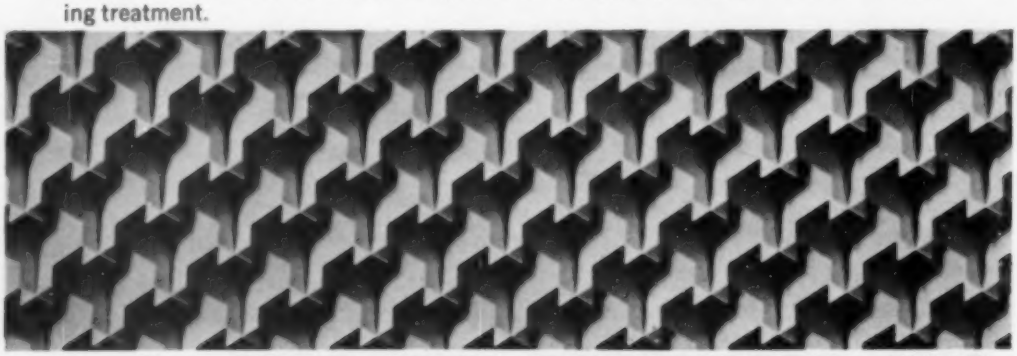


TEXTUR-CEL® INTRA-TEX®

Sizes up to 48" x 96" . . . ¾" cube cell ALUMINUM louvers, baked enamel or anodized finishes . . . For use with Neo-Ray's companion extruded aluminum grid system or as INTRA-TEX trackless non-modular system for completely unbroken wall to wall ceiling treatment.

See Neo-Ray's new QUIET-CEL Louvered Ceiling at the La Fonda del Sol Restaurant, Time Life Building, New York City



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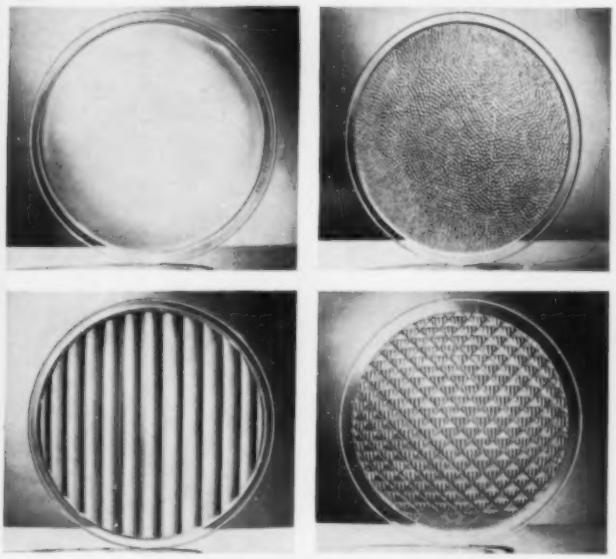
naturally by **NEO-RAY PRODUCTS, INC.**

Dept. I-10 315 EAST 22nd STREET, NEW YORK 10, N. Y.

How Special Lighting Problems are solved by Kopp-Engineered Glass

ACCURATE, UNIFORM, PERMANENT COLORS
and high transmission glassware are achieved through control of glass composition, mold design and custom production.



EXACT LIGHT TRANSMISSION and DISTRIBUTION
of prismatic or fresnel-type lenses and roundels—provide concentrated, condensed, diffused, spread or deflected beam patterns.

INCREASED MECHANICAL STRENGTH
is accomplished by developing special compositions, annealing and tempering. The ball-drop test is used to determine resistance to impact.

HIGH THERMAL SHOCK RESISTANCE
and heat-resisting properties are engineered into Kopp floodlight cover glasses, lenses, industrial globes, and other items.

Perhaps Kopp can help you. Write us about your lighting problem. Early consultation may save you time and money.

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PAT. #2,826,684

INCANDESCENT LIGHTING FIXTURES by PRESCOLITE

NEW (patent applied for)
counter balanced
double acting
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SQUARE

AND

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- *Beautiful shallow silhouette. Round or square hand blown Thermopal glass. 100-300 Watts.*
- *No frames, latches or visible means of glass support (U.S. Pat. No. 2,826,684).*
- *Prewired recessed housings with exclusive 27 cubic inch junction box (U.S. Pat. No. 2,561,986).*
- *Vertical lamping.*

PRESCOLITE MANUFACTURING CORPORATION

2229 Fourth Street, Berkeley 10, California

FACTORIES: Berkeley, California • Warrington, Pennsylvania • El Dorado, Arkansas

Write for complete catalog information

WHEN YOU DESIGN LIGHTING SAVE YOUR CUSTOMERS TROUBLE... INCREASE LAMP LIFE... KEEP HIGH LIGHTING LEVELS... SPECIFY BALLASTS MARKED ®

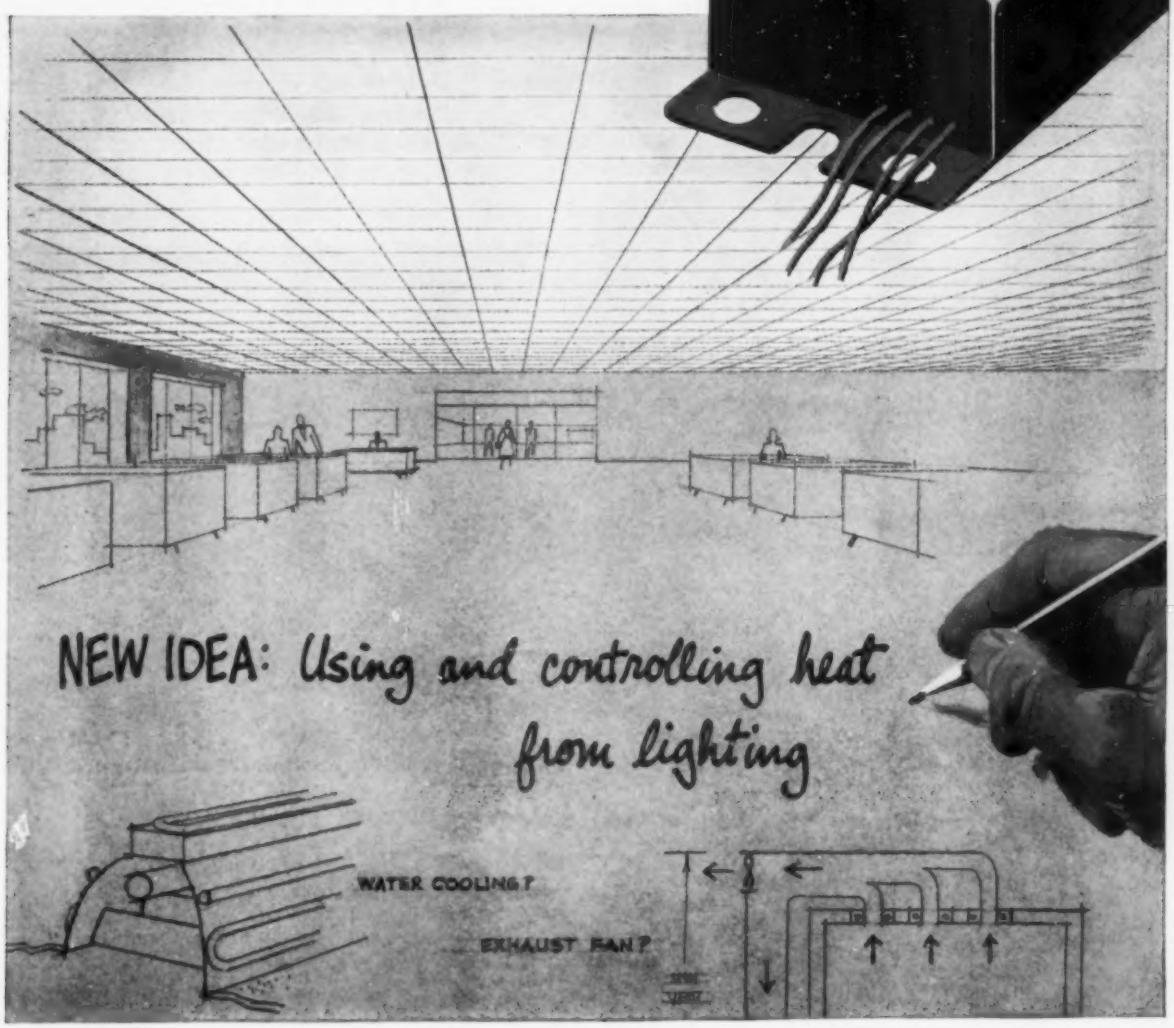
Using and controlling heat from lighting is one of the newest techniques to get extra value from lighting. This can cut cooling cost, step up heating economy, increase comfort **. . . and improve lighting efficiency.**

In such a lighting system, too, Certified CBM ballasts for fixtures are important. Made to specifications for top lighting performance, and checked by ETL test, CBM ballasts help assure longer lamp life, high lighting levels and dependable operation.

For a reprint, which discusses controlling lighting heat, write **CERTIFIED BALLAST MANUFACTURERS,** 2116 Keith Bldg., Cleveland 15, Ohio.

Participation in CBM is open to any manufacturer who wishes to qualify.

1-61



NEW HEXCEL HONEYGLO....

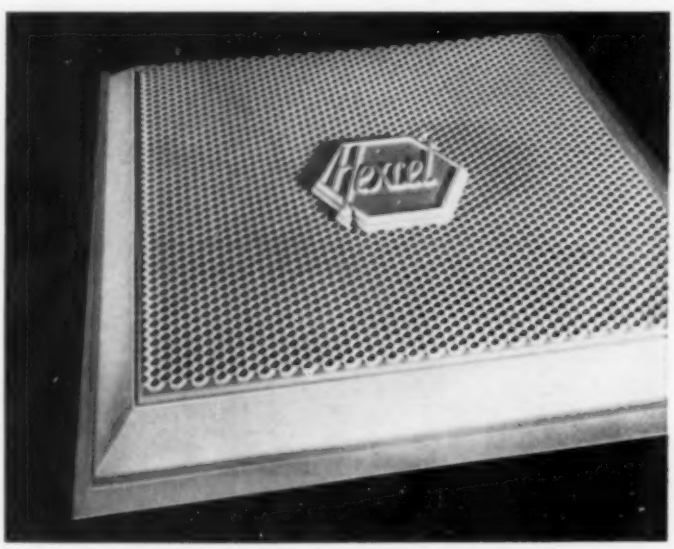
Improved Light Diffusion with the Distinctive "Honeycomb Look"

NEW HONEYGLO

luminous ceiling panels offer an appreciably higher Coefficient of Utilization than any other standard plastic light diffuser. The reason? HONEYGLO's attractive honeycomb surface pattern provides over 2000 individual light-diffusers. Standard 2' x 2' HONEYGLO panels are easy to install with a T-bar system... just as easy to remove for regular maintenance. Double-pan construction cuts down "show-through" from below of objects that may fall from above. HONEYGLO panels can't attract dirt and dust because they're destaticized... can't support combustion because they're self-extinguishing.

NEW design individuality can be added to Honeyglo panels by custom molding company name, trademark, or medallion into the honeycomb surface of the panels. Without sacrificing illumination levels, this unique decorative accent complements other interior design features of clubs, restaurants, hotels, or institutions.

HONEYGLO luminous ceilings are a product of Hexcel Products Inc., manufacturers of HONEYLITE® open-cell honeycomb louvers. For complete information on the Hexcel product best suited to your lighting requirements, call your nearest Hexcel representative. Or write Dept. H-10.



HEXCEL® PRODUCTS INC.

Stronger, lightweight materials for industry

Executive Offices: 2332 Fourth St., Berkeley 10, Calif.
Plants: Berkeley, Oakland, El Segundo, Calif.; Havre de Grace, Md.
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Available in Canada through Curtis Lighting, Ltd., Toronto, Ontario

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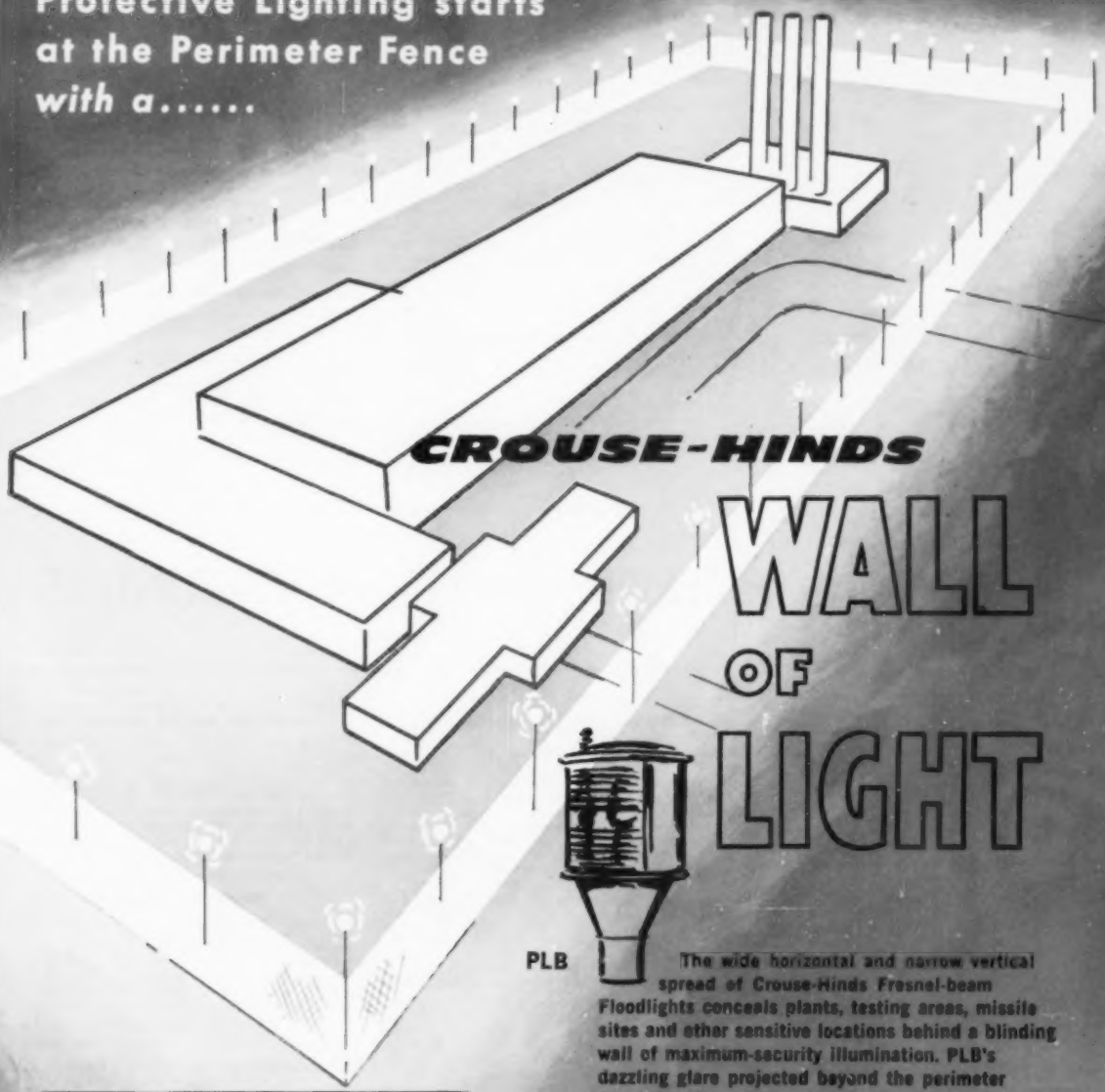
Protective Lighting starts at the Perimeter Fence *with a.....*



CROUSE-HINDS

WALL OF LIGHT

PLB

The wide horizontal and narrow vertical spread of Crouse-Hinds Fresnel-beam Floodlights conceals plants, testing areas, missile sites and other sensitive locations behind a blinding wall of maximum-security illumination. PLB's dazzling glare projected beyond the perimeter fence clearly outlines all movement on the approaches, yet obscures guard, patrol and other activity on plant property.

Modified beams conform to land contours. No shadows. No blind spots. Multiple and series types afford economical current distribution for varying line lengths. A range of sizes, wattages and foot-candles satisfy all plant-geometry and topographical requirements.

ADE
incandescent

MVE
mercury-vapor

ADE and MVE Productive-Area Floodlights turn Nighttime into Day

Whether you need incandescent ADE or mercury-vapor MVE lights for your plant or building areas depends on hours of burning, relamping difficulties and labor costs. Whatever your requirements, wide or narrow beam, short or long range, Crouse-Hinds has a highly-efficient, heavy-duty projector especially for the job.

For detailed information call your Crouse-Hinds distributor or ask for Floodlight Catalog No. 2714.

CROUSE HINDS

REG. U.S. PAT. OFF.

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Rules and Regulations Relating to the Use of Submersible Lighting for Swimming Pools, Reflector Pools and Display Fountains.

Bulletin No. 17

17.1 General—Effective as of this date, the use of 120-volt lamps when assembled in submersible lighting units, for the illumination of swimming pools, reflector pools or display fountains, whether they are intended for side wall or pedestal mounting, is hereby prohibited.

17.2 Voltage—The permissible voltage that may be applied to lamps used for such application shall not exceed 12 volts.

17.3 Transformers—a. Step-down transformers used in conjunction with such lighting units shall be of the two-winding, isolating type and having a grounded metallic shield between the primary and secondary windings to prevent accidental contact between windings under fault conditions. b. Transformers shall be located remotely from the lighting units which they supply, and over-current protection shall be provided in both primary and secondary windings.

17.4 Swimming pools, reflector pools, or display fountains presently

LIFESAVER

Underwater lighting is serious business.

Deadly serious.

Cutting corners can cost lives.

Precisely why the Stonco line is solid cast bronze. Porosity-tested. With a special low voltage transformer for safety plus.

(We've tamed the high voltage. Isolated it with a grounded shield that stops cross-over from primary to secondary. Harnessed it with a fuse factory-sealed to guard against do-it-yourself electricians.)

Even the deck box is gasketed watertight fore and aft. Keeps wiring bone dry. From surface slop, seeping water, or pool overflow caused by flash floods.

No wonder Stonco submarine lighting meets all the safety codes.

Incidentally, even our fountain lights are available low voltage.

Fish have to live too.

STONCO lighting

Write for Catalog G.

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KENILWORTH, NEW JERSEY

(*Continued from page 26A*)

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To be announced.

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SENIOR DESIGN ENGINEER AVAILABLE

Desires responsible position in a senior engineering or administrative capacity. Over 15 years' experience in commercial and industrial lighting field. Excellent background in all phases of luminaire design, performance specification writing, photometry, manufacturing and tooling techniques for both interior and exterior lighting equipment. Capable of working with architects, engineers, and contractors concerning custom lighting system and equipment. Full particulars of qualifications and experience will be supplied on request. Address Box 501, Publications Office, Illuminating Engineering Society, 345 E. 47th St., New York 17, N. Y.

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For quality line of ARCHITECTURAL COLD CATHODE LIGHTING for Coves, Luminous/Louverall Ceilings & Walls and Custom Application. Knowledge and experience in lighting sales engineering type of contacts with architects, engineers, lighting consultants and electrical contractors is a prime requisite. All territories open except greater New York City, Washington, D. C., Conn. and New England areas. State territories covered and lines carried. Address Box 499, Publications Office, Illuminating Engineering Society, 345 E. 47th St., New York 17, N. Y.

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Luminous Ceiling representatives wanted for Neo-Ray's new WOOD-BEAM luminous ceiling—SCALLOP-CEL, TEXTUR-CEL, INTRA-CEL, INTRA-TEX aluminum louvered ceilings. Heavy architect-designer promotional backing in Architectural Record and Interiors each month. Engineering literature for continuous specification by architects and engineers. Territories open include CHICAGO and ST. LOUIS. Contact:

Sales Manager
Neo-Ray Products Inc.
315 East 22nd St.
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LIGHTING SALES ENGINEERS

Manufacturer since 1895 desires lighting sales engineers with following among Architects, Engineers, Distributors, etc. Engineered line of Commercial Fluorescent and Incandescent lighting fixtures. 78-page hard-back catalog. Corning and Holophane Controlens. Many territories open. Forward complete resume. State lines carried. The Kayline Co., 1241 E. 45th St., Cleveland 14, Ohio.

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In Sales Administration. Excellent sales supervisory-management experience with proven creative ability in lighting industry. Aggressive young Sales major seeks association that offers opportunity to perform at management level. Address Box 503, Publications Office, Illuminating Engineering Society, 345 E. 47th St., New York 17, N. Y.

AMERICAN MANUFACTURERS OF LIGHTING EQUIPMENT

If you are interested in a profitable sales market, we can offer an association with a Canadian Manufacturer of residential and commercial lighting equipment—with national sales force calling on distributors, engineers, chain stores. For further information please contact Box 500, Publications Office, Illuminating Engineering Society, 345 E. 47th St., New York 17, N. Y.

LIGHTING SALESMEN WANTED

Fast-growing, progressive New York City Manufacturer of commercial lighting equipment needs salesmen with following among architects and engineers in New York City and other sales areas. Replies in strictest confidence. Our people know of this ad. Write Kent Lighting Corp., 500 Johnson Ave., Brooklyn 37, New York, N. Y.

REPRESENTATIVES WANTED

The Mitchell Lighting Division seeks qualified representation for its full line of commercial, industrial, institutional and outdoor fluorescent lighting equipment. Applicant should be conversant with and have entry into the offices of architects and engineers or have public utility, distributor or contractor experience. Many territories are currently available. Send full details to Mitchell Lighting Division, 1800 North Spaulding Ave., Chicago 47, Illinois.

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To be announced.

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To be announced.

Suwannee River Chapter—Southeastern Region

To be announced.

Tar Heel Section—Southeastern Region

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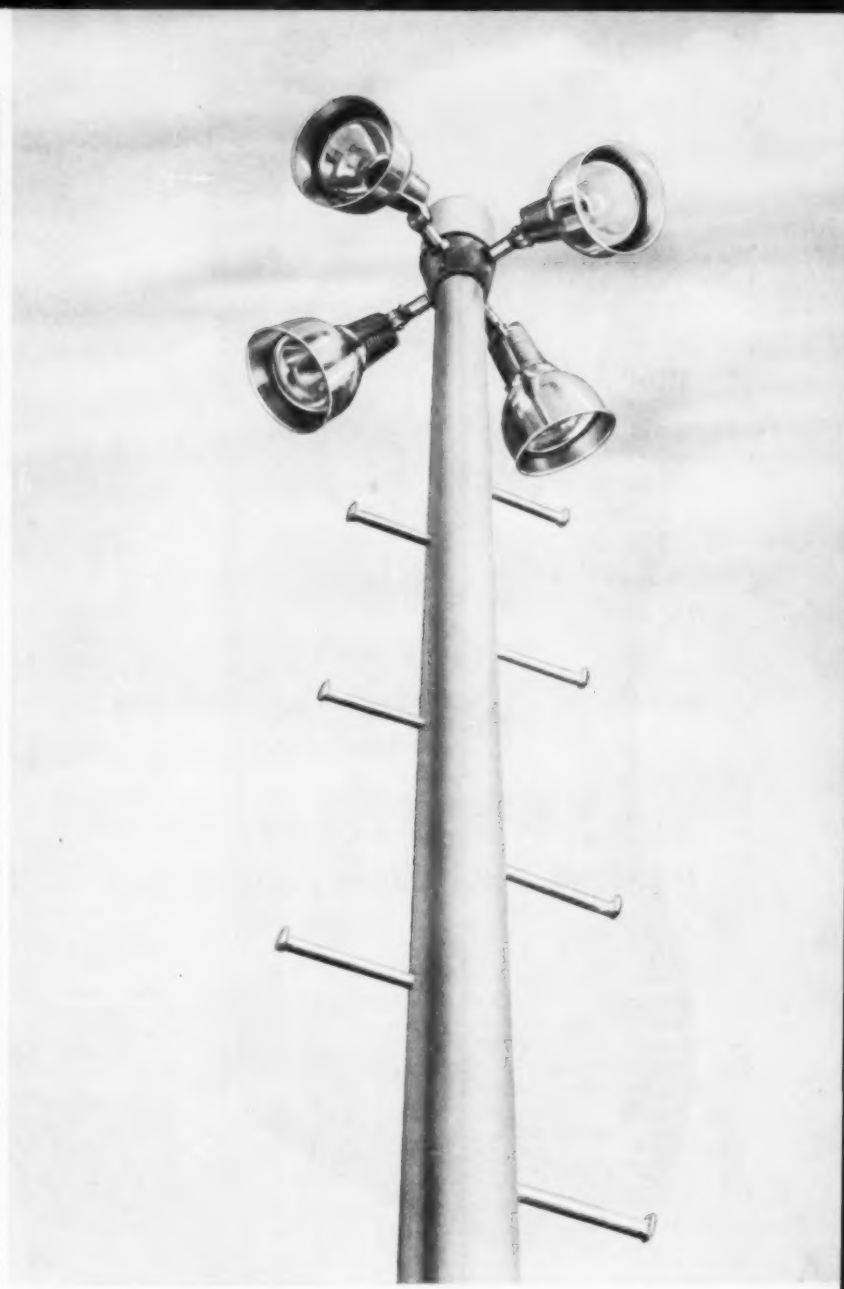
Secretary—W. F. ROBINSON, 5701 Preston Lane, Charlotte 7, N. C.

(Continued on page 46A)



In 1966 someone will climb this pole ...not before

You are looking at Stonco sealed-beam mercury vapor floodlights.

Hermetically sealed inside each lamp is a brilliant silvered reflector.

The reflector stays brilliant because nothing ever touches it. Not dust, dirt or grime. Not even smoke, soot or chemicals in hazardous areas.

You climb the pole only to change lamps. This could easily be once every five years. Probably longer.

(Conventional floodlight reflectors lose up to 15% efficiency if not cleaned every three months.)

What do you want from a mercury vapor floodlight? Higher lumen output? Longer lamp life? Lower power consumption?

Stonco sealed-beam mercury vapor gives you all of this, at far less cost. Plus . . .

Absolutely no maintenance.

STONCO lighting

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(Continued from page 45A)

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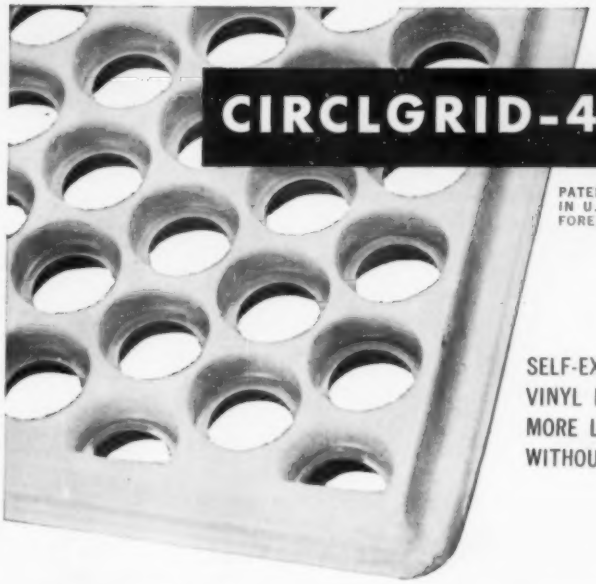

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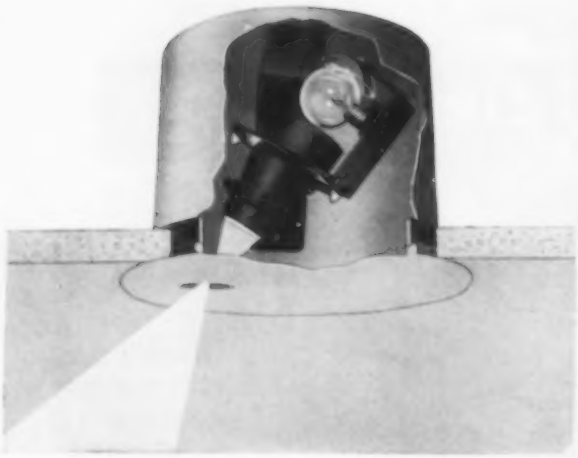

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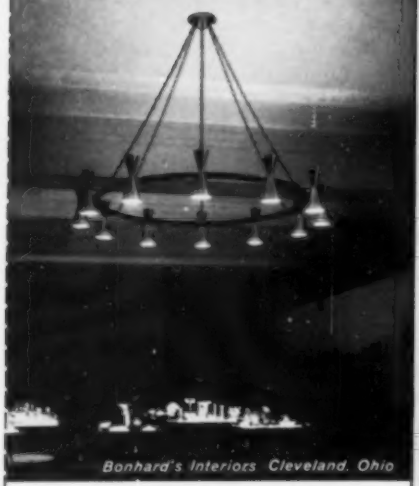

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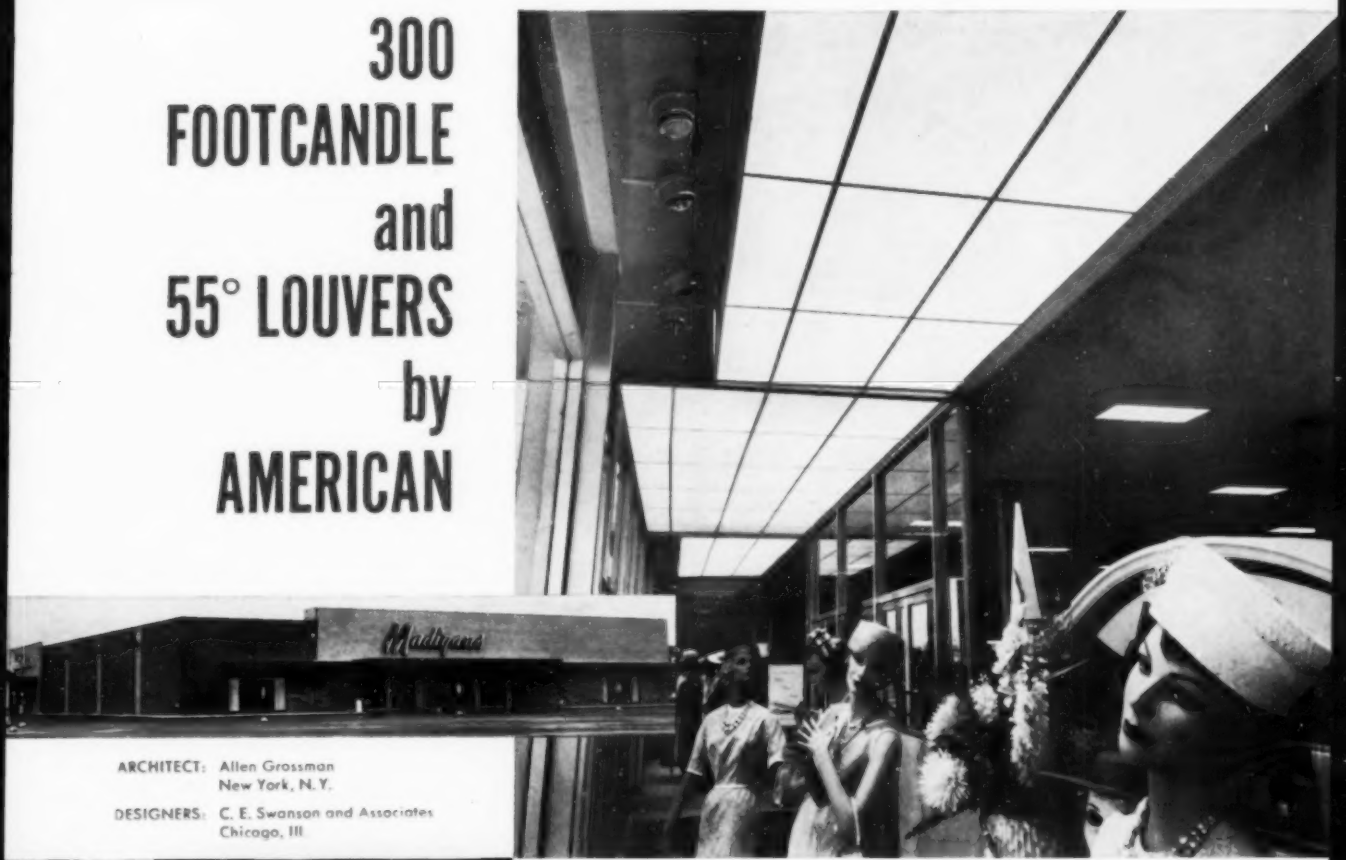

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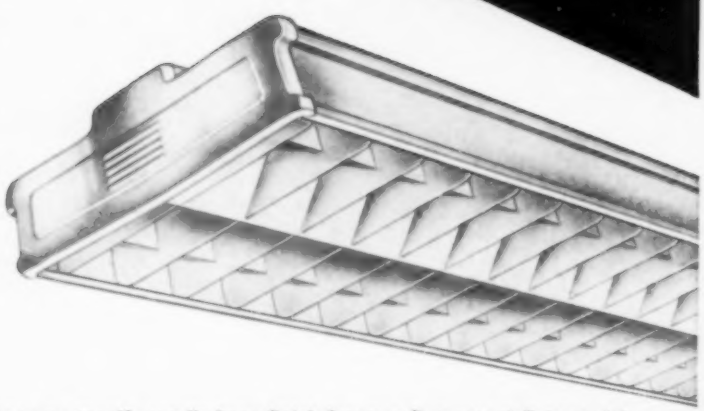

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